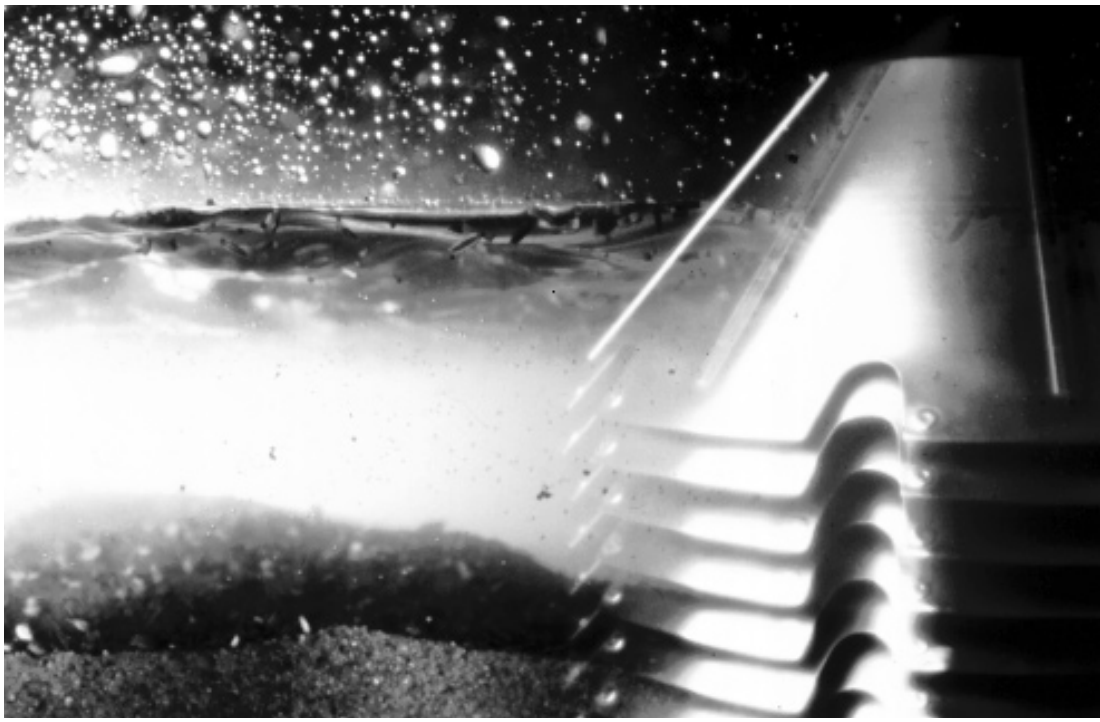
MFPX 307TFD-21



Separator Manual

Product No. 881139-01-06
Book No. 1270774-02 V1

Alfa Laval

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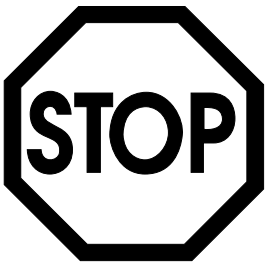
Contents



Study instruction manuals and observe the warnings before installation, operation, service and maintenance.

Not following the instructions can result in serious accidents.

In order to make the information clear only foreseeable conditions have been considered. No warnings are given, therefore, for situations arising from the unintended usage of the machine and its tools.

1 Read this first

This manual is designed for operators and service engineers working with the Alfa Laval separator MFPX 307TFD-21.

For information concerning the function of the separator, see ‘‘3 Separator Basics” on page 15 and chapter ‘‘8 Technical Reference” on page 177.

If the separator has been delivered and installed by Alfa Laval as part of a processing system, this manual is a part of the System Manual. In this case, study carefully all the instructions in the System Manual.

In addition to this Separator Manual a Spare Parts Catalogue, SPC is supplied.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Separator Manual and Spare Parts catalogue

This Separator Manual consists of:

Safety Instructions

Pay special attention to the safety instructions for the separator. Not following the safety instructions can cause accidents resulting in damage to equipment and serious injury to personnel.

Separator Basics

Read this chapter if you are not familiar with this type of separator.

Operating Instructions

This chapter contains operating instructions for the separator only.

Service Instructions

This chapter gives instructions for daily checks, cleaning, oil changes, servicing and check points.

Dismantling / Assembly

This chapter contains step-by-step instructions for dismantling and assembly of the separator for service and repair.

Trouble-tracing

Refer to this chapter if the separator functions abnormally.

If the separator has been installed as part of a processing system always refer to the Trouble-tracing part of the System Manual first.

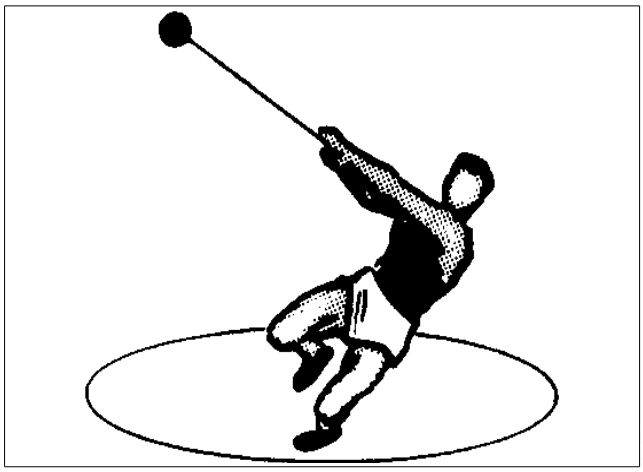
Technical Reference

This chapter contains technical data concerning the separator and drawings.

2 Safety Instructions

The centrifugal separator includes parts that rotate at high speed. This means that:

- Kinetic energy is high
- Great forces are generated
- Stopping time is long



Manufacturing tolerances are extremely fine. Rotating parts are carefully balanced to reduce undesired vibrations that can cause a breakdown. Material properties have been considered carefully during design to withstand stress and fatigue.

The separator is designed and supplied for a specific separation duty (type of liquid, rotational speed, temperature, density etc.) and must not be used for any other purpose.

Incorrect operation and maintenance can result in unbalance due to build-up of sediment, reduction of material strength, etc., that subsequently could lead to serious damage and/or injury.

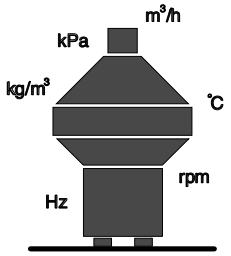
The following basic safety instructions therefore apply:

- **Use the separator only for the purpose and parameter range specified by Alfa Laval.**
- **Strictly follow the instructions for installation, operation and maintenance.**
- **Ensure that personnel are competent and have sufficient knowledge of maintenance and operation, especially concerning emergency stopping procedures.**
- **Use only Alfa Laval genuine spare parts and the special tools supplied.**

DANGER

Disintegration hazards

- Use the separator only for the purpose and parameter range specified by Alfa Laval.
- If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.
- When power cables are connected, always check direction of motor rotation. If incorrect, vital rotating parts could unscrew.
- Check that the gear ratio is correct for power frequency used. If incorrect, subsequent overspeed may result in a serious break down.
- Welding or heating of parts that rotate can seriously affect material strength.
- Wear on the large lock ring thread must not exceed safety limit. ϕ-mark on lock ring must not pass opposite ϕ-mark by more than specified distance.
- Inspect regularly for **corrosion** and **erosion** damage. Inspect frequently if process liquid is corrosive or erosive.



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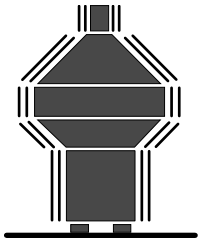


S0055611

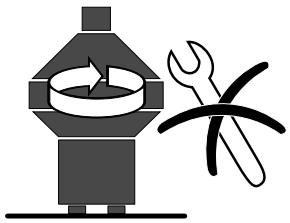
DANGER

Entrapment hazards

- Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.
- To avoid accidental start, switch off and lock power supply before starting **any** dismantling work.
- Assemble the machine **completely** before start. **All** covers and guards must be in place.

Electrical hazards

- Follow local regulations for electrical installation and earthing (grounding).



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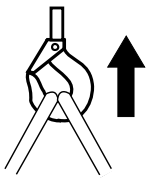
WARNING

Crush hazards

- Use correct lifting tools and follow lifting instructions.
- Do **not** work under a hanging load.



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Noise hazards

- Use ear protection in noisy environments.

S0051611

CAUTION

Burn hazards

- Lubrication oil and various machine surfaces can be hot and cause burns.

Cut hazards

- Sharp edges on separator discs and lock ring threads can cause cuts.

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S0054311

Warning signs in the text

Pay attention to the safety instructions in this manual. Below are definitions of the three grades of warning signs used in the text where there is a risk for injury to personnel.

DANGER

Type of hazard

This type of safety instruction indicates a situation which, if not avoided, could result in **fatal injury** or fatal damage to health.

WARNING

Type of hazard

This type of safety instruction indicates a situation which, if not avoided, could result in **disabling injury** or disabling damage to health.

CAUTION

Type of hazard

This type of safety instruction indicates a situation which, if not avoided, could result in **light injury** or light damage to health.

NOTE

This type of instruction indicates a situation which, if not avoided, could result in damage to the equipment.

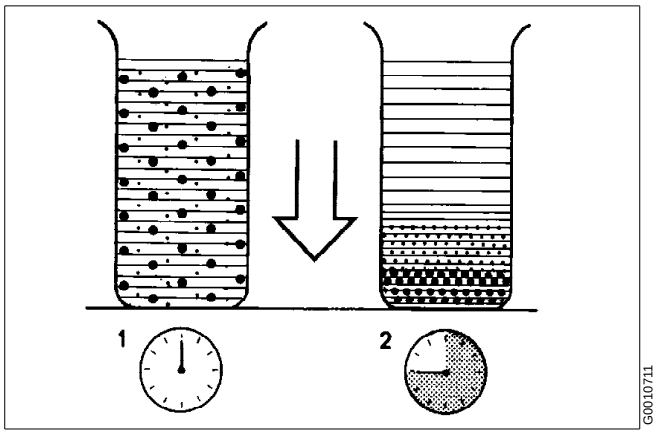
3 Separator Basics

Contents

3.1 Basic principles of separation

The purpose of separation can be:

- to free a liquid of solid particles,
- to separate two mutually insoluble liquids with different densities while removing any solids presents at the same time,
- to separate and concentrate solid particles from a liquid.



Sedimentation by gravity

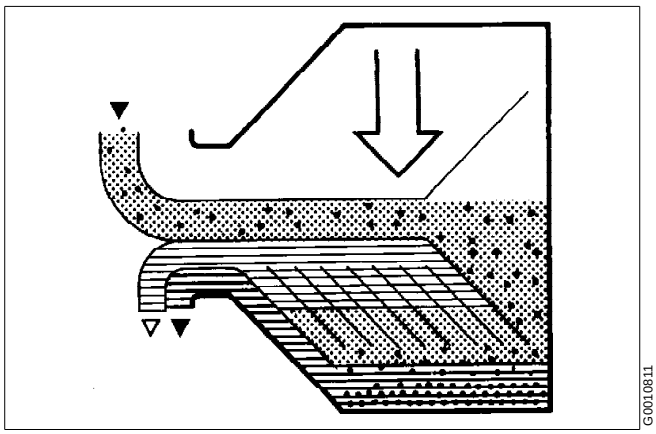
3.1.1 Separation by gravity

A liquid mixture in a stationary bowl will clear slowly as the heavy particles in the liquid mixture sink to the bottom under the influence of gravity.

A lighter liquid rises while a heavier liquid and solids sink.

Continuous separation and sedimentation can be achieved in a settling tank having outlets arranged according to the difference in density of the liquids.

Heavier particles in the liquid mixture will settle and form a sediment layer on the tank bottom



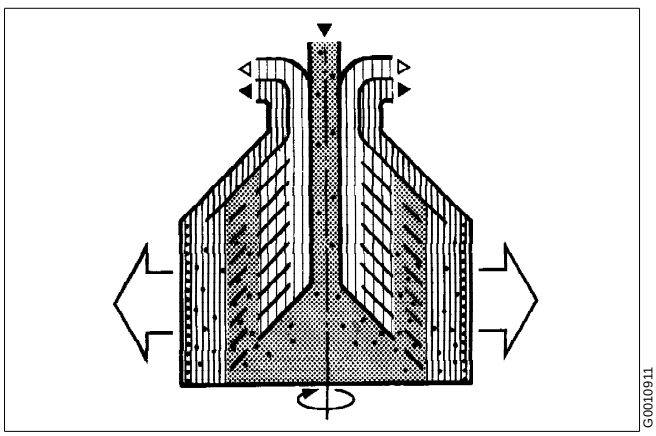
Sedimentation in a settling tank, with outlets making it possible to separate the lighter liquid parts from the heavier

3.1.2 Centrifugal separation

In a rapidly rotating bowl, the force of gravity is replaced by centrifugal force, which can be thousands of times greater.

Separation and sedimentation is continuous and happens very quickly.

The centrifugal force in the separator bowl can achieve in a few seconds what takes many hours in a tank under influence of gravity.



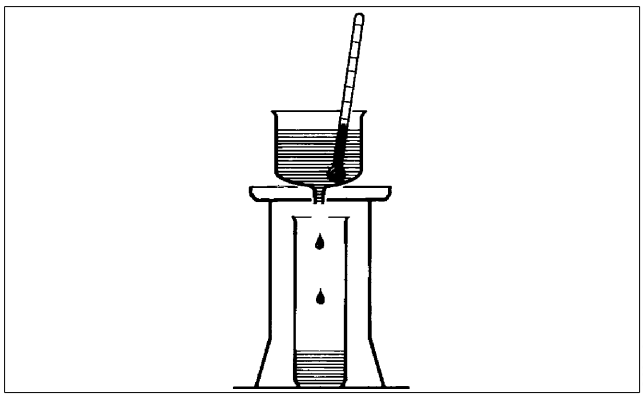
The centrifugal solution

3.1.3 Separating temperatures

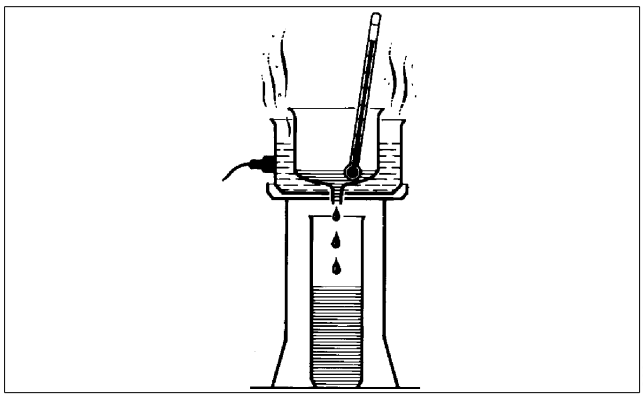
For some types of process liquids (e.g. mineral oils) a high separating temperature will normally increase the separation capacity. The temperature influences oil viscosity and density and should be kept constant throughout the separation.

Viscosity

Low viscosity facilitates separation. Viscosity can be reduced by heating.



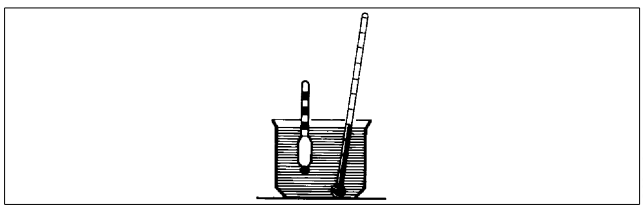
High viscosity (with low temperature)



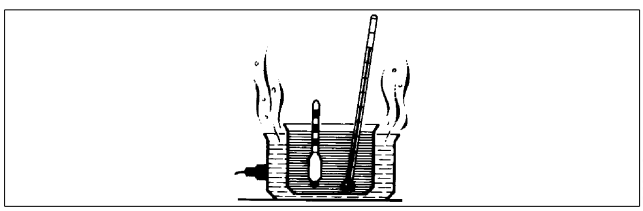
Low viscosity (with high temperature)

Density difference (specific gravity ratio)

The greater the density difference between the two liquids, the easier the separation. The density difference can be increased by heating.



High density (with low temperature)



Low density (with high temperature)

3.2 Design and function

3.2.1 Overview

The separator comprises a processing part and a driving part. It is driven by an electric motor (4).

Mechanically, the separator machine frame is composed of a bottom part, a top part and a frame hood. The motor is flanged to the frame as shown in the illustration. The frame feet (5) are vibration damping.

The bottom part of the separator contains a flat belt transmission (7), a friction coupling (6) and a vertical spindle (3).

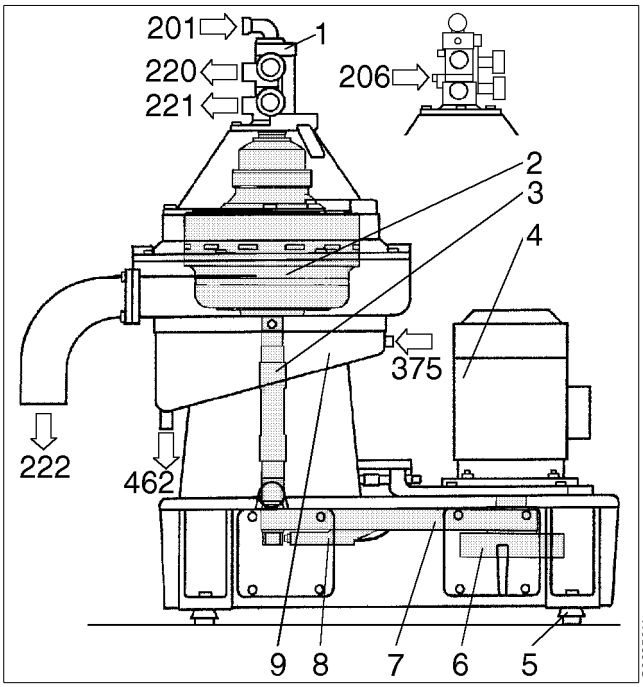
The bottom part also contains an oil bath for lubrication of spindle bearings and a brake.

The frame top part and the frame hood contain the processing parts of the separator, the inlet, outlets and piping(1).

The liquid is cleaned in the separator bowl (2). This is fitted on the upper part of the vertical spindle and rotates at high speed in the space formed by the frame top part and frame hood. The bowl also contains the discharge mechanism which empties the sludge from the bowl.

An unbalance sensor (9) and a speed sensor (8) is optional equipment for monitoring the separator operation.

The main inlets and outlets are shown with connection numbers in the illustration. These numbers correspond with the numbers used in the connection list (page 180) and the basic size drawing (page195).



201. Dirty oil inlet
206. Displacement/conditioning water inlet
220. Clean oil outlet
221. Water outlet
222. Sludge discharge outlet
375. Bowl operating water inlet
462. Drain of frame top part

1. Inlet and outlet device
2. Bowl
3. Vertical driving device with bowl spindle
4. Electric motor
5. Frame feet
6. Friction coupling
7. Flat belt transmission
8. Speed sensor (optional)
9. Unbalance sensor (optional)

3.2.2 Mechanical power transmission

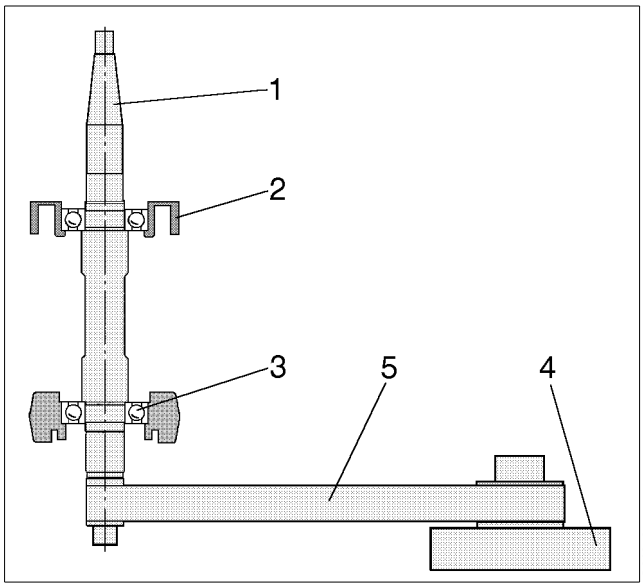
The main parts of the power transmission between motor and bowl are shown in the illustration.

The friction coupling (4) ensures a gentle start and acceleration and at the same time prevents overloading of the belt and motor.

The flat belt transmission has a ratio which increases the bowl speed several times compared with the motor speed.

To reduce bearing wear and the transmission of bowl vibrations to the frame and foundation, the top bearing of the bowl spindle is mounted in a spring damped bearing seat (2).

The bearings on the spindle are lubricated by the oil splash produced by an oil pump.

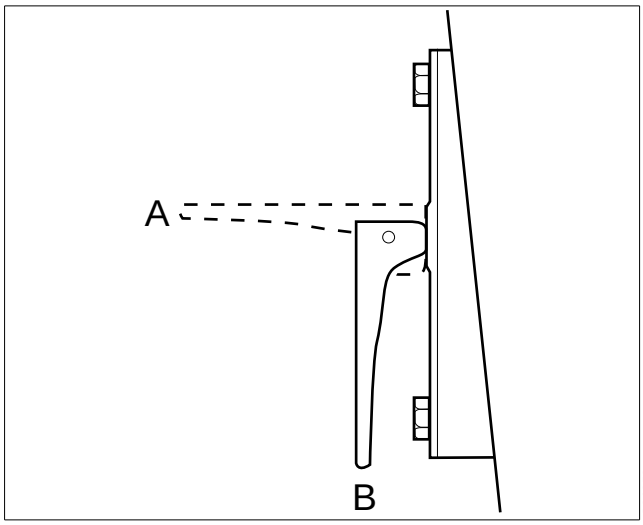


1. *Bowl spindle*
2. *Top bearing and bearing seat*
3. *Bottom bearing*
4. *Friction coupling*
5. *Flat belt*

Brake

The separator is equipped with a brake to be used when stopping the separator. The use of the brake reduces the retardation time of the bowl and critical speeds will therefore be quickly passed.

The brake lining acts on the outside of the friction coupling.



A = Brake applied
B = Brake released

3.2.3 Sensors and indicators

Back pressure gauge (1)

Correct limits for the back pressure in the clean oil outlet can be found in chapter ‘‘8.2 Connection list” on page 180.

Increasing back pressure in the clean oil outlet can be caused by:

- restriction in the outlet piping, e.g. a buckled or bent pipe,
- increased throughput,
- increased viscosity, decreased separating temperature.

Indicating pressure gauge (2)

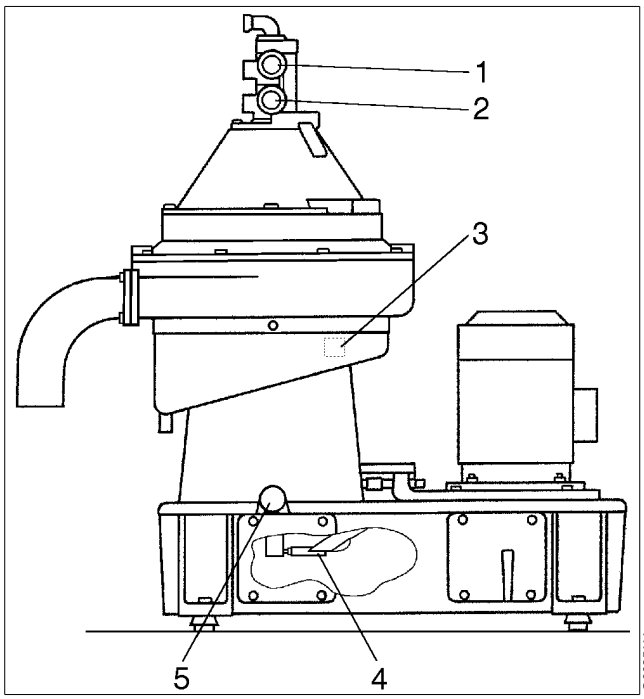
During normal operation, the indicating pressure gauge in the water outlet will indicate pressure of less than 1 bar. If the pressure increases and exceeds 1 bar, this indicates abnormal operating conditions for the separator caused by:

- increased back pressure in the clean oil outlet,
- clogged disc stack.

See also chapter ‘‘7.2.6 High pressure in water outlet” on page 176.

Unbalance sensor (3, option)

For indication of any abnormal unbalance the separator can be equipped with a sensor monitoring the radial position of the bowl spindle.



1. Back pressure gauge
2. Indicating pressure gauge
3. Unbalance sensor(option)
4. Speed sensor (option)
5. Sight glass

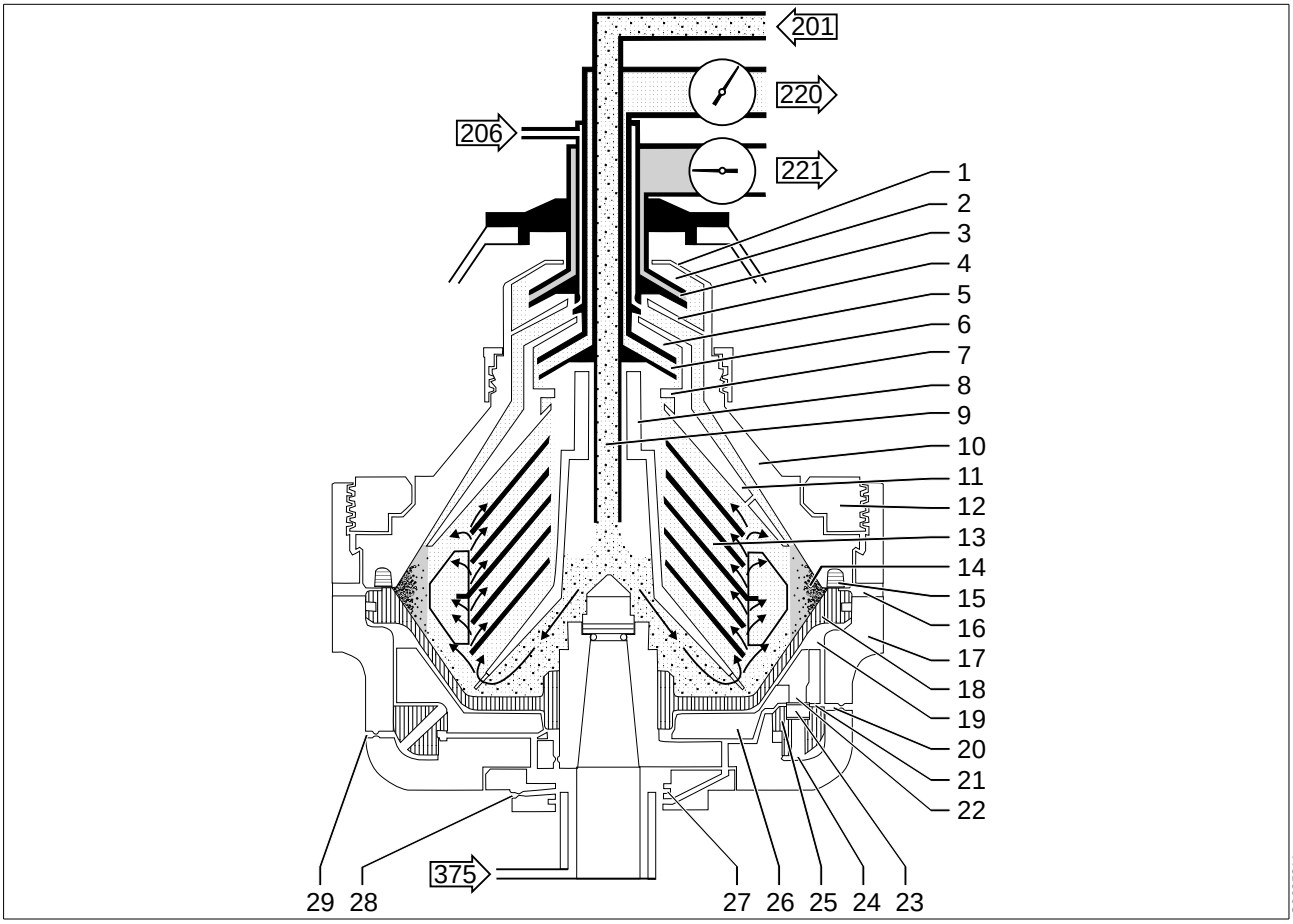
Speed sensor (4, option)

An optional speed sensor indicates the speed of the separator. The correct speed is needed to achieve the best separating results and for reasons of safety. The number of revolutions for correct speed is shown in chapter“8.1 Technical data” on page 178. Refer to name plate for speed particulars.

Sight glass (5)

The sight glass shows the oil level in the oil sump.

3.2.4 Process main parts



Separator bowl, feed and discharge assembly, control paring disc and liquid flow. Non-rotating parts are indicated by black shade.

201. Oil inlet
206. Displacement/conditioning water inlet
220. Clean oil outlet
221. Water outlet
*375. Operating water inlet**
1. Paring chamber
2. Upper paring chamber
3. Upper paring disc
4. Flow control disc
5. Oil paring chamber
6. Oil paring disc
7. Top disc level ring
8. Distributor
9. Inlet pipe
10. Bowl hood
11. Top disc
12. Large lock ring
13. Bowl disc stack
14. Sludge space
*15. Bowl hood seal ring **
*16. Sludge port **
17. Bowl body
*18. Sliding bowl bottom **
19. Closing water space
*20. Nozzle **
21. Opening chamber
22. Drain channels
*23. Drain valve **
24. Closing chamber
*25. Operating slide **
*26. Distributing ring **
27. Operating water ring
*28. Nozzle **
*29. Nozzle **

** Parts effecting a sludge discharge*

Inlet and outlet device

The inlet and outlet device consists of the following parts:

- The inlet (201). This comprises the pipe bend and the long inlet pipe (9) which extends into the middle of the bowl.
- The outlets (220, 221). These comprise the outlet housings and the paring discs (3, 6) which pump the separated oil and water out of the bowl. Each paring disc is located in a paring chamber (2, 5) in the top of the bowl.

The inlet and outlet device is held together by the inlet pipe threading and a nut forming a complete unit.

The unit is fastened to the separator frame hood. Height adjusting rings determine the height position of the paring discs in the paring chambers.

Separator bowl and sludge discharge mechanism

The separator bowl with its sludge discharge mechanism is built-up as follows:

The bowl body (17) and bowl hood (10) are held together by the large lock ring (12). Inside the bowl are the distributor (8) and the disc stack (13). The disc stack is kept compressed by the bowl hood. The sliding bowl bottom (18) forms an internal separate bottom in the bowl.

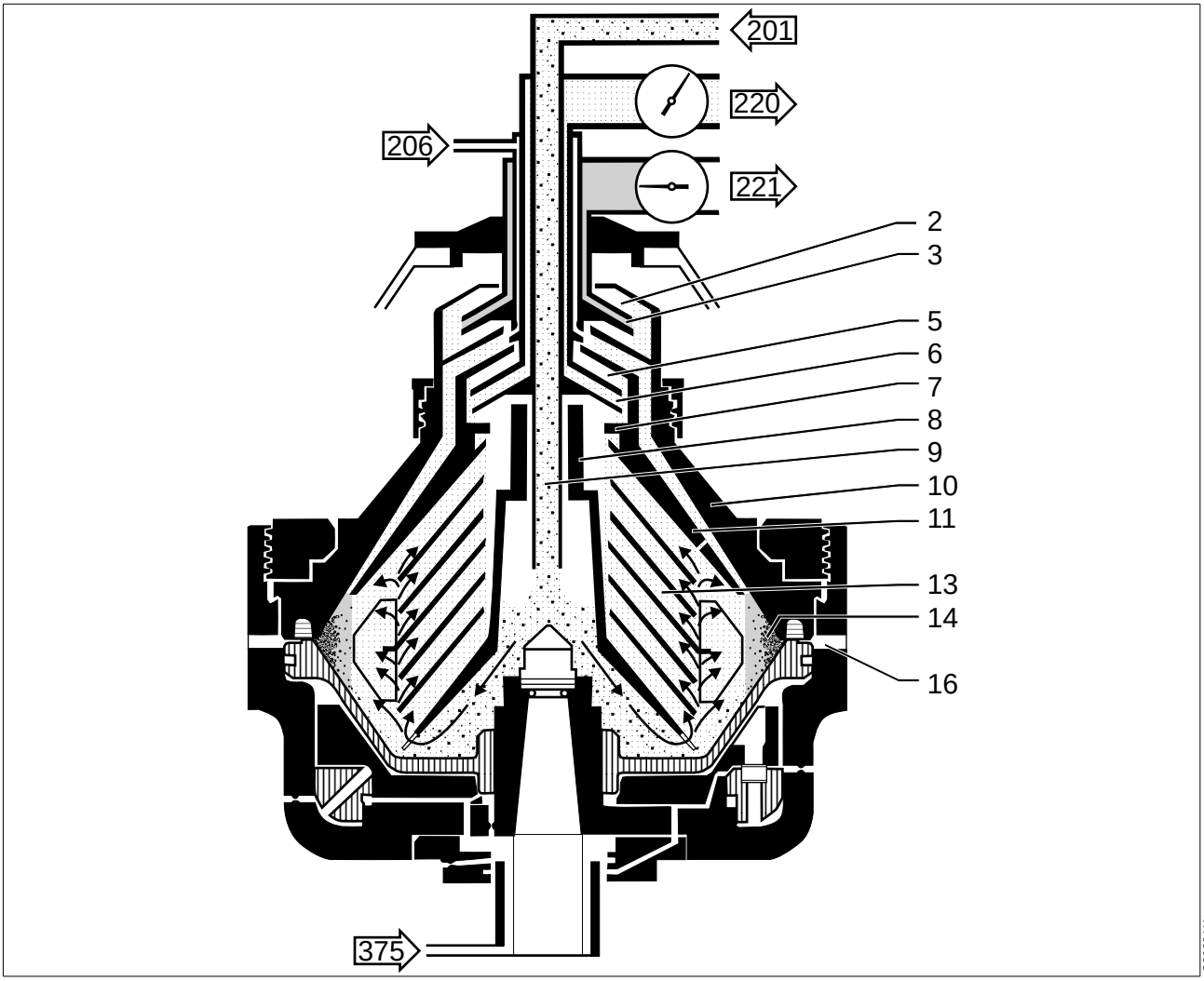
The bowl top is covered by the paring chamber (1). The space between this cover and the flow control disc (4) is the upper paring chamber (2) with the upper paring disc (3) which pumps the separated water out of the bowl. The oil paring chamber (5) with its paring disc (6) is located inside the upper part of the top disc (11). From this space the cleaned oil is pumped out of the bowl.

The sludge space (14) is the space between the sliding bowl bottom, the bowl hood and the disc stack in the bowl periphery. It is kept closed by the sliding bowl bottom (18) which seals against a seal ring (15) in the bowl hood.

At intervals decided by the operator, the sliding bowl bottom drops to empty the bowl of sludge.

The sludge discharge mechanism, which controls the sliding bowl bottom, comprises an operating slide (25) and an operating water device. Passive parts are: nozzles (20, 28, 29)) and valves (23). The operating water device on the underside of the bowl supplies operating water (375) to the discharge mechanism via the operating water ring (27).

3.2.5 Separating function



201. Unseparated oil, inlet
206. Displacement/conditioning water inlet
220. Clean oil outlet
221. Water outlet
375. Operating water
2. Upper paring chamber
3. Upper paring disc
5. Oil paring chamber
6. Oil paring disc
7. Top disc level ring
8. Distributor
9. Inlet pipe
10. Bowl hood
11. Top disc
13. Bowl disc stack
14. Sludge space
16. Sludge port

Normal operation

Unseparated oil is fed into the bowl through the inlet pipe (9) and is pumped via the distributor (8) towards the periphery of the bowl.

When the oil reaches slots of the distributor, it will rise through the channels formed by the disc stack (13) where it is evenly distributed.

The oil is continuously cleaned as it travels towards the center of the bowl. When the cleaned oil leaves the disc stack it rises upwards, flows over the top disc level ring (7) and enters the oil paring chamber (5). From the latter it is pumped by the oil paring disc (6) and leaves the bowl through outlet (220). Separated water, sludge and solid particles are forced towards the periphery of the bowl and collected in the sludge space (14).

The space between bowl hood (10) and top disc (11) and also the upper paring chamber (2) are filled with oil, which is distributed over the entire circumference via the groove in the top disc.

During normal operation, the outlet for the upper paring disc (3) is closed by a valve installed in the water outlet (221).

ALCAP™ concept

When the sludge space (14) is filled up and water enters the disc stack (13), traces of water will escape with the cleaned oil. The increase of water content in the cleaned oil is the sign of reduced separation efficiency.

This effect is used as a signal to remove the water from the separator bowl.

The water is discharged in either two ways:

- through the water outlet (221),
- through the sludge ports (16) at sludge discharge.

For further information see the System Manual.

3.2.6 Discharge of separated water

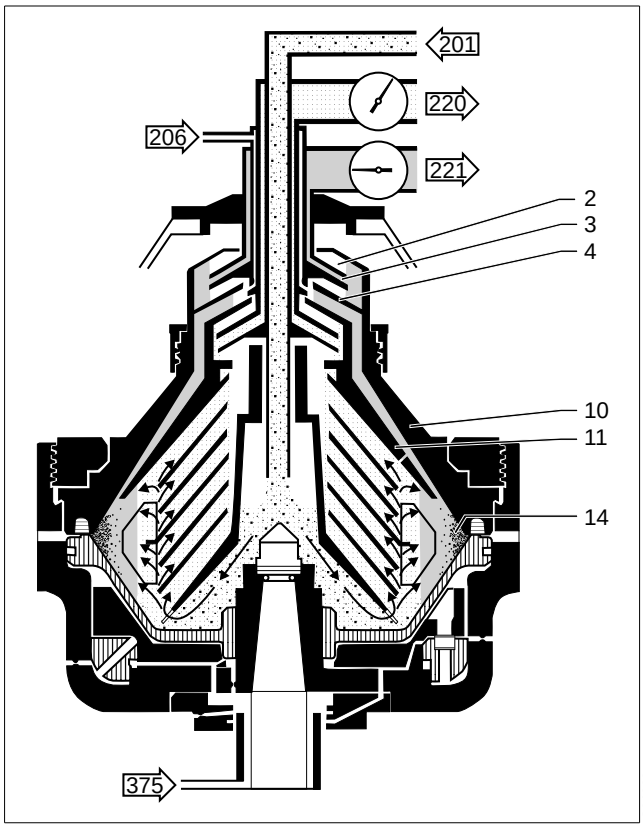
As the water outlet (221) opens, oil in the disc stack acts as a piston pushing water and emulsion towards the periphery of the bowl.

The water and emulsion are forced out through the channel between the top disc (11) and the bowl hood (10). They then pass through the hole in the flow control disc (4) into the upper paring chamber (2) and are pumped out of the bowl by the upper paring disc (3).

A limited amount of oil is lost with each draining. This amount corresponds to the volume in the upper paring disc and the volume between the top disc and the bowl hood.

Stabilizing of levels after draining through water outlet (221)

When the water outlet (221) has closed, oil will pass through the hole in the top disc (11) into the space between the top disc and the bowl hood (10). This oil will gradually displace the water left in the space in the upper paring chamber (2). The displaced water is thus forced out into the sludge space (14) of the bowl.



Drain through water outlet (221)

201. Oil inlet
206. Displacement/conditioning water inlet
220. Clean oil outlet
221. Water outlet
375. Operating water inlet

2. Upper paring chamber
3. Upper paring disc
4. Flow control disc
10. Bowl hood
11. Top disc
14. Sludge space

3.2.7 Sludge discharge cycle

The separator discharges a fixed volume of sludge and water. The discharge volume is approximately 70% of the sludge space volume. The contents of the discharge can contain some emulsified oil.

Operating water

Operating water (closing and opening water) to the sliding bowl bottom is supplied through a distributing cover under the bowl, for closing and opening functions.

Closing water is supplied during the starting sequence, during the sludge discharge sequence and, at intervals (5 seconds every 5 minutes) during the separation sequence. During the separation sequence the supply of closing water is to replace possible leakage and is termed make-up water.

Opening water is supplied simultaneously with the closing water through the same operating water inlet (375)

Closed bowl (normal operation)

Between discharges the sludge ports (16) are covered by the sliding bowl bottom (18). The sliding bowl bottom is normally pressed upwards against a seal ring (15) by the hydraulic force of the operating water in the closing water space (19). This force is greater than the force of the process liquid above the sliding bowl bottom.

Bowl opens for discharge

Depending on the water content of the oil displacement water is added via inlet (206) to the bowl in order to push the oil towards the centre of the bowl prior to a sludge discharge.

Opening water is fed for about 0,5 seconds overflowing the operating water ring (27).

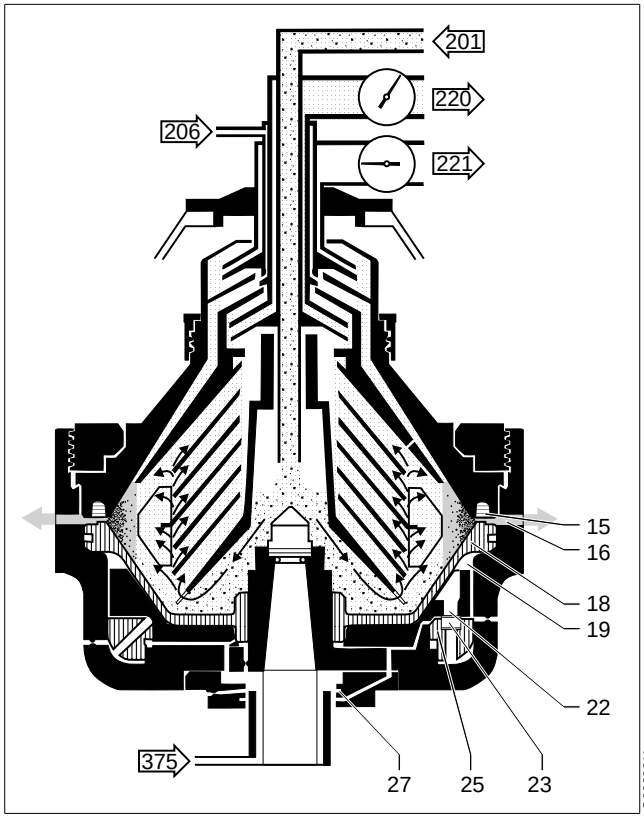
The operating water enters the space above the operating slide (25), which moves downwards. The drain channels (22) open and the closing water drains out. This allows the force on the underside of the sliding bowl bottom (18) to become lower than the force on the upper side. The sliding bowl bottom moves down wards and sludge and water are discharged through ports (16).

In the meantime operating water ring (27) and the space above the operating slide (25) is continuosly drained through the respective nozzles.

Bowl closes after discharge

When opening water supply stops and the opening water above the operating slide (25) has been drained the closing water pushes the operating slide upwards and closes the drain valves (23).

The closing water which is supplied during the entire discharge cycle (about 5 seconds), now fills the space below the sliding bowl bottom (18) and pushes it back in closed position.



Sludge discharge

201. Oil inlet
206. Displacement/conditioning water inlet
220. Clean oil outlet
221. Water outlet
375. Operating water inlet

15. Bowl hood seal ring
16. Sludge port
18. Sliding bowl bottom
19. Closing water space
22. Drain channels
23. Drain valve
25. Operating slide
27. Operating water ring

Bowl closing water is supplied during the sludge discharge sequence and at intervals during the separation sequence to replace evaporated water.

After the sludge discharge conditioning water is filled to the bowl via inlet (206) provided the water content of the oil is low or extremely low.

3.2.8 High back pressure

High back pressure in the clean oil outlet may be a result of:

- restriction in the piping, e.g. an indented pipe,
- too high throughput,
- too high viscosity,
- too low separating temperature.

During normal operation, the indicating pressure gauge in the water outlet will indicate a pressure of less than 1 bar.

When the back pressure in the clean oil outlet rises, the oil surface in the oil paring chamber (5) will move towards the center of the bowl.

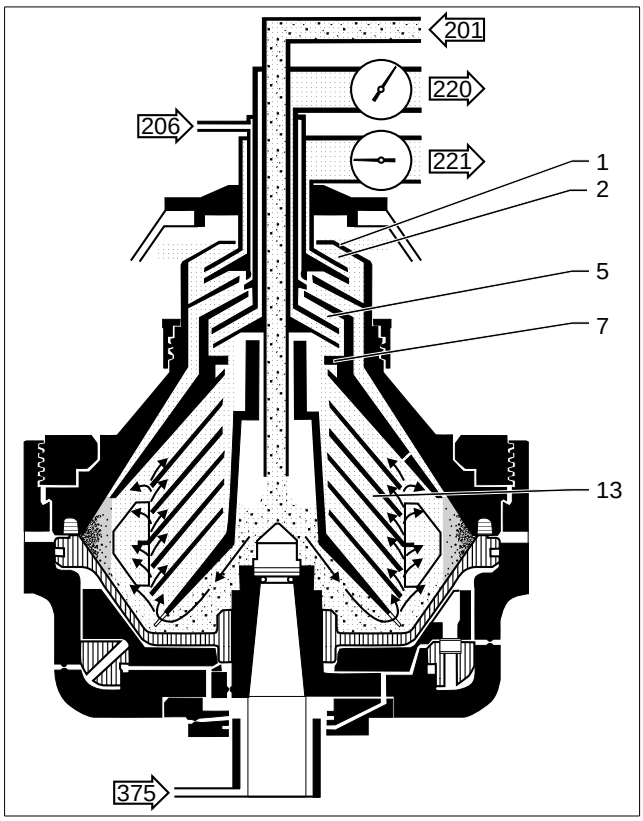
At a certain back pressure, the oil surface comes into contact with the inner oil surface in the disc stack (13) and a even surface is formed.

If the back pressure is high enough, the common inner oil surface diameter will decrease to a smaller size than the top disc level ring (7).

This in turn causes the inner oil surface diameter in the upper paring chamber (2) also to move towards the centre of the bowl.

Eventually, the inner oil surface will have moved so far towards the centre, that the back pressure is now excessively high.

The oil will then leave the bowl at the top through the upper paring chamber and flow over the edge of the paring chamber (1). The high pressure in the clean oil outlet will be detected by a high pressure sensor in the clean oil outlet of the separation system, see the System Manual.



Sludge discharge

201. Oil inlet
206. Displacement/conditioning water inlet
220. Clean oil outlet
221. Water outlet
375. Operating water inlet

1. Paring chamber
2. Upper paring chamber
5. Oil paring chamber
7. Top disc level ring
13. Bowl disc stack

3.3 Definition

Back pressure	Pressure in the separator outlet.
Clarification	Liquid/solids separation with the intention of separating particles, normally solids, from a liquid (oil) having a lower density than the particles.
Clarifier disc	An optional disc, which replaces the gravity disc in the separator bowl, in the case of clarifier operation. The disc seals off the heavy phase (water) outlet in the bowl, thus no liquid seal exists.
Counter pressure	See Back pressure.
Density	Mass per volume unit. Expressed in kg/m^3 at specified temperature, normally at 15 °C.
Gravity disc	Disc in the bowl hood for positioning the interface between the disc stack and the outer edge of the top disc. This disc is only used in purifier mode.
Interface	Boundary layer between the heavy phase (outer) and the light phase (inner) in a separator bowl.
Intermediate Service (IS)	Overhaul of separator bowl and inlet/outlet. Renewal of seals in bowl and gaskets in inlet/outlet device.
Major Service (MS)	Overhaul of the complete separator, including bottom part (and activities included in an Intermediate Service). Renewal of seals and bearings in bottom part.
Purification	Liquid/liquid/solids separation with the intention of separating two intermixed and mutually insoluble liquid phases of different densities. Solids having a higher density than the liquids can be removed at the same time. The **lighter** liquid phase (oil), which is the major part of the mixture, shall be purified as far as possible.
Sediment (sludge)	Solids separated from a liquid.
Sludge discharge	Ejection of sludge from the separator bowl.
Throughput	The feed of process liquid to the separator per time unit. Expressed in m^3/h or litre/h.
Viscosity	Fluid resistance against movement. Normally expressed in centistoke (cSt = mm ^{2}/s), at specified temperature.
Water seal	Water in the solids space of the separator bowl to prevent the light phase (oil) from leaving the bowl through the heavy phase (water) outlet, in purifier mode.

4 Operating Instructions

Contents

4.1 Operating routine

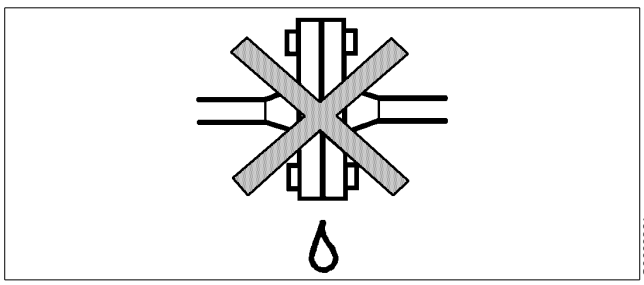
These operating instructions describe routine procedures to follow before and during the start, running and stopping sequences of the separator.

If there is a System Manual, always follow the operating instructions of the System Manual. If there is no System Manual the instructions below are to be followed.

4.1.1 Ready for start

To achieve the best separation results the bowl should be in a clean condition.

1. Check that the bolts of the frame hood are fully tightened.
2. Check that all inlet and outlet connections have been correctly made and properly tightened.



CAUTION

Burn hazards

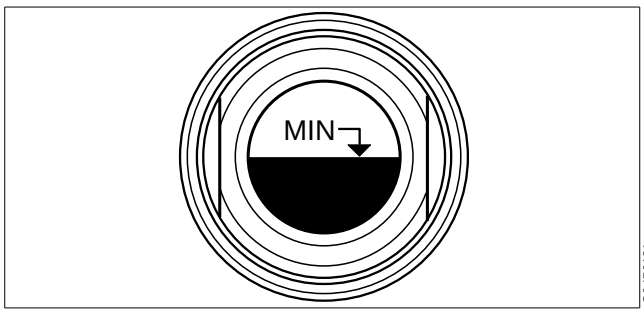
Make sure that hose connections and flange couplings are properly assembled and tightened.

Escaping hot liquid can cause burns.

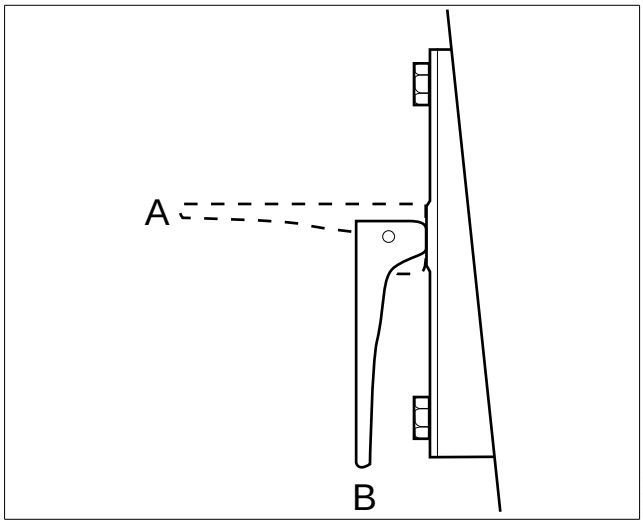
3. Check that the oil level is in the middle of the sight glass. Fill if necessary.

   See chapter ‘‘5.7.1 Oil change procedure” on page 84.

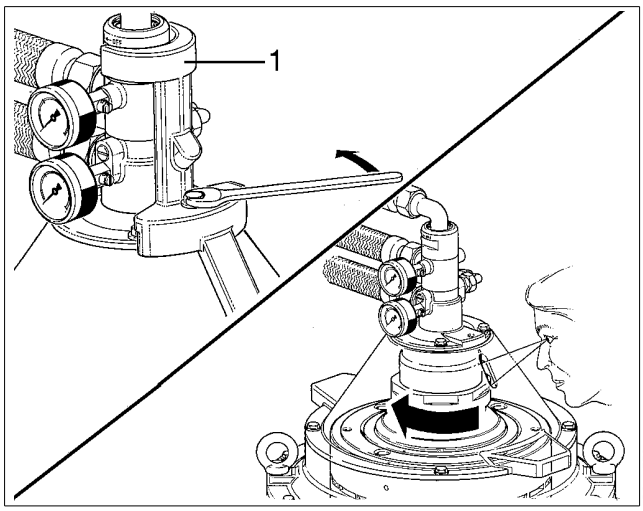
   See chapter ‘‘8.5.2 Recommended lubricating oils” on page 190.



4. Make sure that the brake is released (B position).



5. Check the direction of rotation of the bowl.



DANGER

Disintegration hazards

When power cables have been connected, always check direction of rotation.

If incorrect, vital rotating parts could unscrew.

Proceed as follows:

a. Remove the safety device.

b. Make a quick start and stop on the motor starter.

c. Look through the slot in the frame hood. See illustration.

d. If wrong rotation direction, rectify.

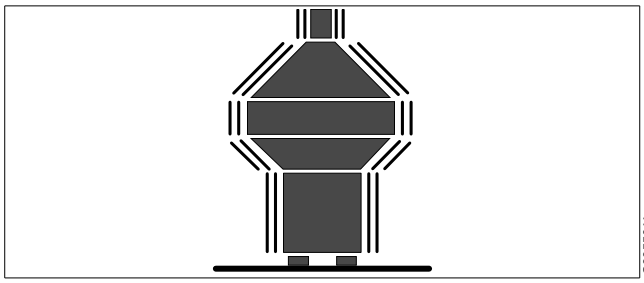
e. Fit safety device.

NOTE

The correct rotation direction can also be found on the machine plate.

4.1.2 Start

1. Start the separator.
2. Check the separator for vibration. Some vibration can occur for short periods during the starting cycle, when the separator passes through its critical speeds. This is normal and passes over without danger. Try to learn the vibration characteristics of the critical speed pattern.



DANGER

Disintegration hazards

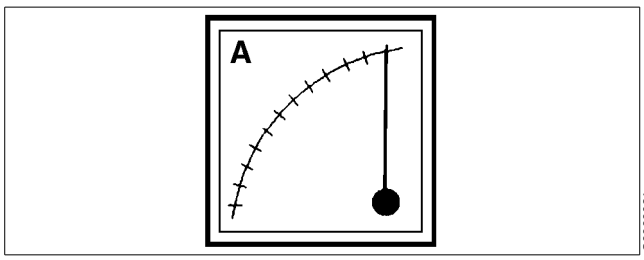
When excessive vibration occurs, **keep liquid feed on** and **stop** separator.

The cause of the vibration must be identified and rectified before the separator is restarted. Excessive vibration may be due to incorrect assembly or insufficient cleaning of the bowl.

3. If possible check the current consumption of the motor starter to ensure that the separator has reached full speed.

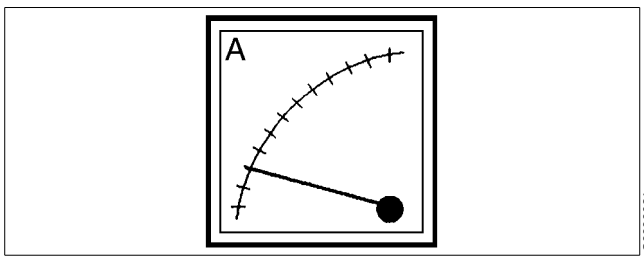
   During start, the current reaches a peak and then drops slowly. When the friction coupling engages, the current slowly increases again before decreasing to a low and stable level, which is the normal current during running.

   The time to reach full speed may not exceed the limit given in chapter “8.1 Technical data” on page 178.



Current increases when the coupling engages...

4. When running normally, open the closing water valve (connection 375) for approximately 5 seconds to close the bowl.



... to decrease to a stable value when full speed has been reached.

4.1.3 Running

1. Check that the feed has the correct flow and temperature. See chapter ‘‘8.1 Technical data” on page 178 for correct values.
2. Discharge by opening the valve for opening water (connection 375) until a discharge is heard. For maximum and minimum time for discharge intervals, see page 178.

DANGER

Disintegration hazards

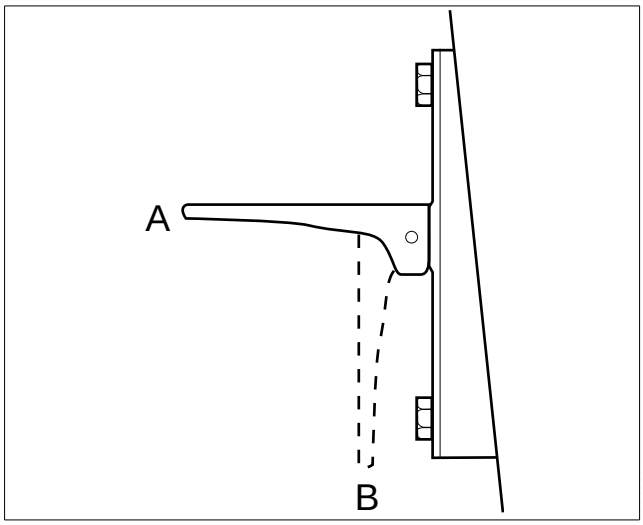
Ensure that correct discharge intervals and cleaning procedures are used.

Unbalance due to improper washing out of solids may lead to contact between rotating and non-rotating parts.

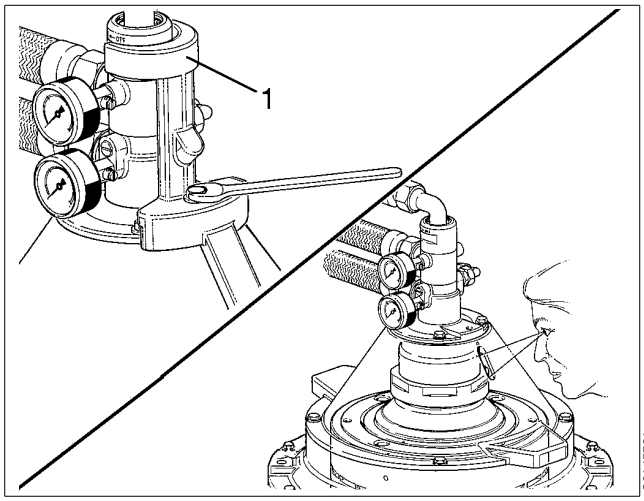
4.1.4 Normal stop

1. Carry out a sludge discharge before stopping the separator. Otherwise the bowl must be cleaned manually before the next start up.

   The volume of the discharged sludge must be compensated for by additional feed.
2. After discharge, turn off the feed and stop the separator with the bowl filled with liquid.
3. Apply the brake (A position).



4.1.5 Safety stop



DANGER

Entrapment hazards

Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

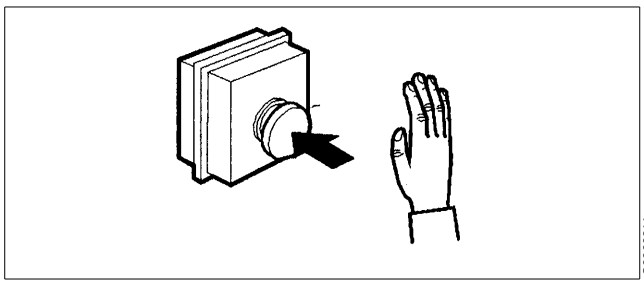
Remove safety device (1) and look through the slot in the frame hood to see if the bowl still rotates.

To avoid accidental start, switch off and lock power supply before starting any dismantling work.

1. If the separator begins to vibrate excessively during operation, stop it immediately by pushing the safety stop. The separator motor is switched off.

   Keep the oil feed on during the run-down to minimize the excessive vibration.

2. Evacuate the room. The separator may be hazardous when passing its critical speeds during the run-down.



DANGER

Disintegration hazards

Do not discharge a vibrating separator.

Out-of-balance vibration can become worse if only part of the sediment is discharged.

CAUTION

Disintegration hazards

After a safety stop the cause of the fault must be identified.

If all parts have been checked and the cause remains unclear, contact Alfa Laval for advice.

5 Service Instructions

Contents

5.1 Periodic maintenance

5.1.1 Introduction

Periodic (preventive) maintenance reduces the risk of unexpected stoppages and breakdowns. Follow the maintenance logs on the following pages in order to facilitate periodic maintenance.

DANGER

Disintegration hazards

Separator parts that are either worn beyond their safe limits or incorrectly assembled may cause severe damage or fatal injury.

5.1.2 Maintenance intervals

The following directions for periodic maintenance give a brief description of which parts to be cleaned, checked and renewed at different maintenance intervals.

The maintenance logs for each maintenance interval later in this chapter give detailed enumeration of the check points that must be done.

Daily checks consist of minor check points to carry out for detecting abnormal operating conditions.

Oil change

The oil change interval is every 1500 hours or at least once every year if the total number of operating hours is less than 1500 hours.

When using a group D oil, time of operation between oil changes can be extended from the normal 1500 hours to 2000 hours.

Intermediate Service (IS)

Intermediate Service consists of an overhaul of the separator bowl, inlet/outlet and operating device every 3 months or 2000 operating hours. Seals in bowl and gaskets in inlet/outlet device are renewed.

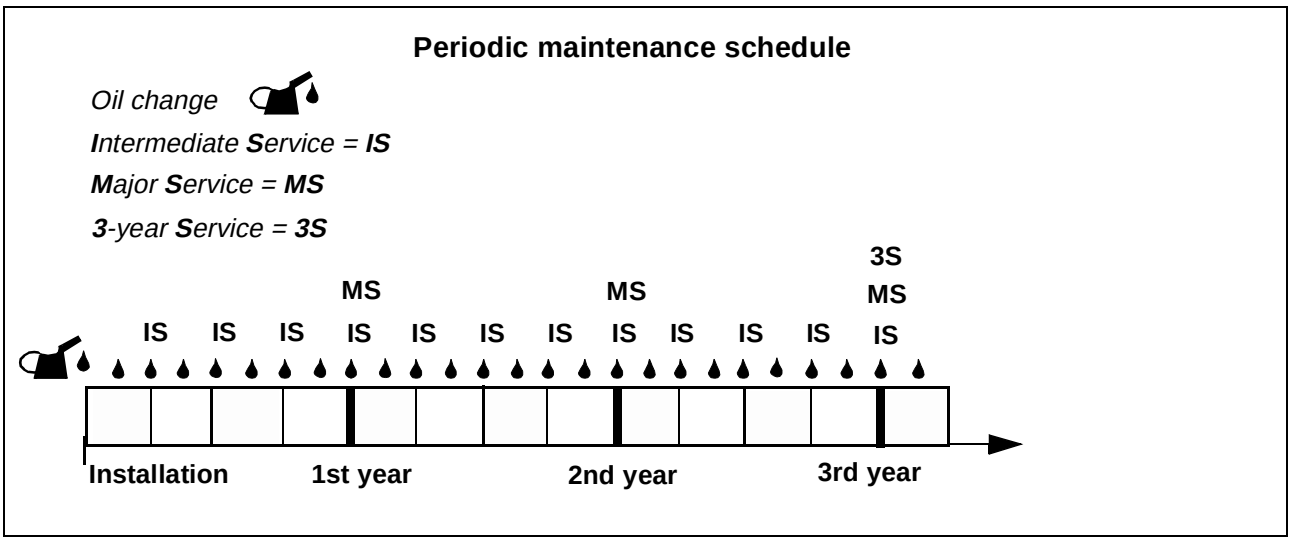
Major Service (MS)

Major Service consists of an overhaul of the complete separator and includes an Intermediate Service every 12 months or 8000 operating hours. Seals and bearings in the bottom part are renewed.

3S - 3-year Service

3-year Service consists of:

- renewing of frame feet (the feet get harder with increased use and age).
- renewing of ball bearings in friction coupling.
- renewing of bottom bearing holder.



5.1.3 Maintenance procedure

At each Intermediate and Major Service, take a copy of the service Log and use it for notations during the service.

An Intermediate and Major Service should be carried out in the following manner:

1. Dismantle the parts as mentioned in the service log and described in chapter “6 Dismantling/Assembly” on page 93.

   Place the separator parts on clean, soft surfaces such as pallets.

2. Inspect and clean the dismantled separator parts according to the service log.

3. Fit all the parts delivered in the service kit while assembling the separator as described in chapter “6 Dismantling/Assembly” on page 93. The assembly instructions have references to check points which should be carried out during the assembly.

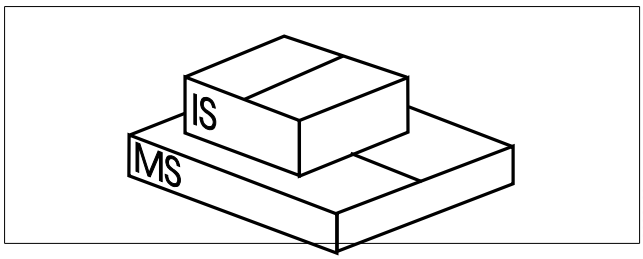
5.1.4 Service kits

Special service kits are available for Intermediate Service (IS) and Major Service (MS). For other services the spare parts have to be ordered separately.

Note that the parts for IS are **not** included in the MS kit.

Note that the parts for 3S are **not** included in the IS and MS kit.

The contents of the service kits are described in the Spare Parts Catalogue.



Kits are available for Intermediate Service and Major Service

NOTE

Always use Alfa Laval genuine parts as otherwise the warranty will become invalid.

Alfa Laval takes no responsibility for the safe operation of the equipment if non-genuine spare parts are used.

5.2 Maintenance Logs

5.2.1 Daily checks

The following steps should be carried out daily.

Main component and activity	Part	Page	Notes
Inlet and outlet			
Check for leakage	Connecting housing	—	
Separator bowl			
Check for vibration and noise		87	
Vertical driving device			
Check for vibration and noise		87	
Check	Oil level in oil sump	84	
Electrical motor			
Check for heat, vibration and noise		1)	

1) See manufacturer’s instruction.

5.2.2 Oil change

The oil change should be carried out every 1500[1)] hours of operation.

Main component and activity	Part	Page	Notes
Vertical driving device			
Renew	Oil in oil sump[2)]	84	

When the separator is running for hort periods, the lubricating oil must be changed every 12 months even if the total number of operating hours is less than 1500 hours (2000 h).

1) When using a group D oil, time of operation between oil changes can beextended from the normal 1500 hours to 2000 hours.

2) See chapter “8.5 Lubricants” on page 188 for further information.

5.2.3 IS - Intermediate Service

Name of plant: Local identification:

Separator: MFPX 307TFD-21 Manufacture No./Year:

Total running hours: Product No: 881139-01-06

Date: Signature:

Main component and activity	Part	Page	Notes
Inlet and outlet			
Clean and inspect	Threads of inlet and outlet pipe(s)	62	
	Connecting housing	—	
Separator bowl			
Clean and check	Small lock ring	—	
	Paring chamber	—	
	Flow control disc	—	
	Paring chamber cover	—	
	Bowl hood	49	
	Top disc	—	
	Bowl discs	82	
	Wing insert	82	
	Distributor	—	
	Sliding bowl bottom	57, 63, 64	
	Operating water ring	62	
	Operating slide	57, 64, 63	
	Bowl body	50,57, 62, 63	
	Recirculation pipe	—	
	Large lock ring	60	
	Distributing ring	57, 63	
	Valve plug	63	
	Paring disc	—	
Check	Corrosion	51	
	Cracks	53	
	Erosion	55	
	Guide surfaces	57	
	Disc stack pressure	70	
Vertical driving device			
Check	Bowl spindle cone	50	
Oil filling device			
Clean and check	Oil filling device	84	

Main component and activity	Part	Page	Notes
Electrical motor		—	
Lubrication (if nipples are fitted)	See sign on motor		
Signs and labels on separator		204	
Check attachment and legibility	Machine plate Power supply frequency Lifting instruction Safety label		
Monitoring equipment (option)			
Function check	Unbalance sensor	65	

Note! Renew all parts included in the Intermediate Service kit (IS).

5.2.4 MS - Major Service

Name of plant: Local identification:

Separator: MFPX 307TFD-21 Manufacture No./Year:

Total running hours: Product No: 881139-01-06

Date: Signature:

Main component and activity	Part	Page	Notes
Inlet and outlet			
Clean and inspect	Threads of inlet and outlet pipe(s)	62	
	Connecting housing	—	
Separator bowl			
Clean and check	Small lock ring	—	
	Paring chamber	—	
	Flow control disc	—	
	Paring chamber cover	—	
	Bowl hood	49	
	Top disc	—	
	Bowl discs	82	
	Wing insert	82	
	Distributor	—	
	Sliding bowl bottom	57, 63, 64, 71	
	Operating water ring	62	
	Operating slide	63, 64, 57	
	Bowl body	57, 62, 63, 71	
	Recirculation pipe	—	
	Large lock ring	60, 73	
	Distributing ring	57, 63	
	Valve plug	63	
	Paring disc	—	
Check	Corrosion	51	
	Cracks	53	
	Erosion	55	
	Guide surfaces	57, 71	
	Disc stack pressure	54	
	Height position of oil paring disc	72	
V**ertical driving device**			
Clean and check	Bowl spindle	—	
	Buffer, buffer springs and bearing seat	69	
Check	Radial wobble of bowl spindle	66	

Main component and activity	Part	Page	Notes
Friction coupling			
Renew (if necessary	Friction pads	70	
Flat belt			
Renew	Flat belt	149	
Oil filling device			
Clean and check	Oil filling device	155	
Clean	Oil sump	84	
Brake			
Check	Arm and springs	67	
Signs and labels on separator		204	
Check attachment and legibility	Machine plate Power supply frequency Lifting instruction Safety label		
Monitoring equipment (option)			
Check	Speed sensor	76	
Function check	Unbalance sensor	65	

Note! Renew all parts included in the Intermediate Service kit (IS) and Major Service kit (MS).

5.2.5 3-year Service (3S)

Renew the frame feet, bottom bearing holder and ball bearings for friction coupling. The 3-year service should be carried out in conjunction with a Major Service (MS). The extent of the 3-year service is the same as for a major service plus the parts mentioned above.

5.3 Check points at Intermediate Service (IS)

5.3.1 Bowl hood seal ring

Poor sealing between the bowl hood seal ring and the sealing edge of the sliding bowl bottom will cause a leakage of process liquid from the bowl.

Renew the bowl hood seal ring at each Intermediate Service (IS) or if the ring is damaged or indented more than 1 mm.

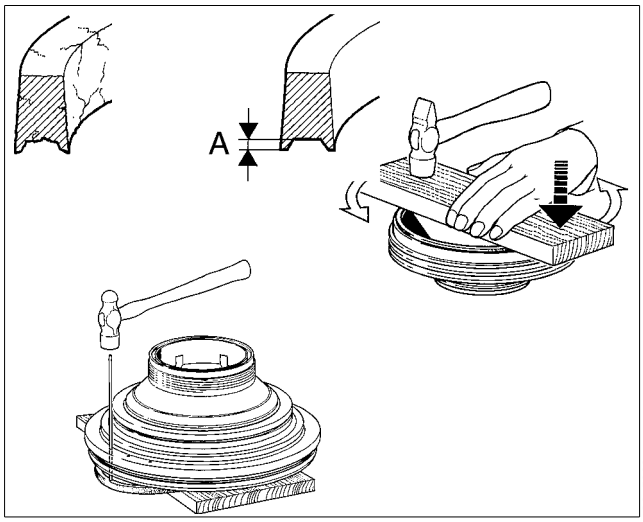
Replacing the seal ring:

1. Knock out the old ring by means of a pin inserted in the holes intended for this purpose.
2. Press the ring into the groove with a straight wooden board placed across the ring.

NOTE

If the new ring is too narrow, place it in hot water (70-80 °C) for about 5 minutes.

If it is too wide, it will shrink after drying in 80-90 °C for about 24 hours.



A = maximum 1,0 mm

5.3.2 Bowl spindle cone and bowl body nave

Impact marks on the spindle cone or in the bowl body nave may cause poor fit and out-of-balance vibrations.

The bowl spindle and the nave should also be checked if the bowl spindle has been dismantled or if the bowl runs roughly.

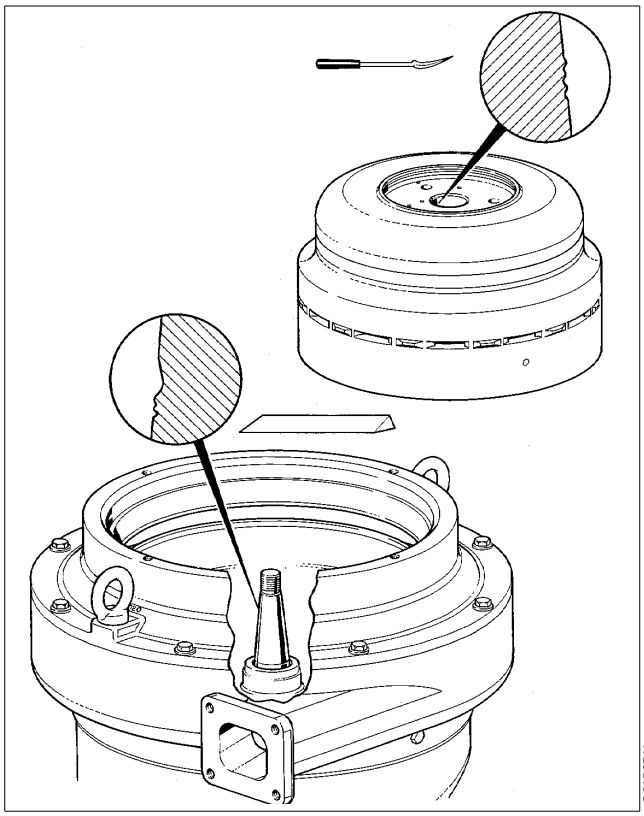
Corrosion may cause the bowl to stick firmly to the spindle cone and cause difficulties during the next dismantling.

- Remove any impact marks with a scraper and/or whetstone.

Rust can be removed by using a fine-grain emery cloth (e.g. No 320). Finish with polishing paper (e.g. No 600).

NOTE

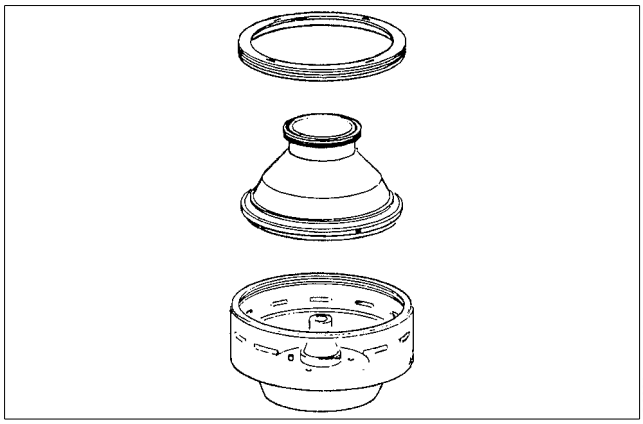
Always use a scraper with great care. The conical form must not be marred.



Check for impact marks and corrosion

5.3.3 Corrosion

Evidence of corrosion attacks should be looked for and rectified each time the separator is dismantled. Main bowl parts such as the bowl body, bowl hood and lock ring must be inspected with particular care for corrosion damage.



DANGER

Disintegration hazard

Inspect regularly for corrosion damage. Inspect frequently if the process liquid is corrosive.

Always contact your Alfa Laval representative if you suspect that the largest depth of the corrosion damage exceeds 1,0 mm or if cracks have been found. Do not continue to use the separator until it has been inspected and given clearance for operation by Alfa Laval.

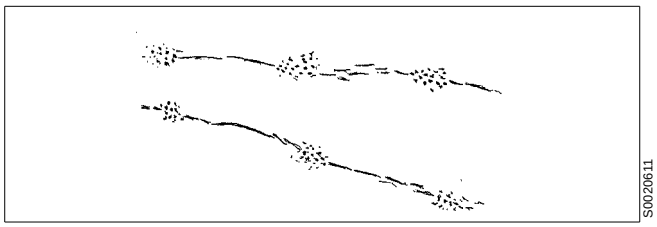
Cracks or damage forming a line should be considered as being particularly hazardous.

Non-stainless steel and cast iron parts

Corrosion (rusting) can occur on unprotected surfaces of non-stainless steel and cast iron. Frame parts can corrode when exposed to an aggressive environment.

Stainless steel

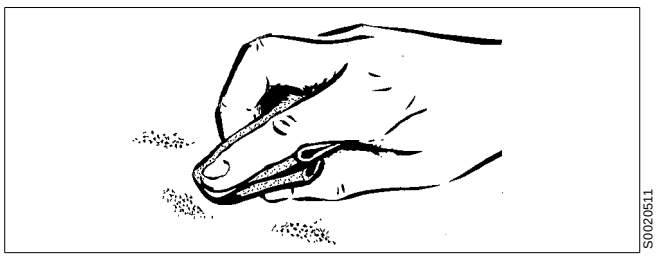
Stainless steel parts corrode when in contact with either chlorides or acidic solutions. Acidic solutions causes a general corrosion. The chloride corrosion is characterised by local damage such as pitting, grooves or cracks. The risk of chloride corrosion is higher if the surface is:



- Exposed to a stationary solution.
- In a crevice.
- Covered by deposits.
- Exposed to a solution that has a low pH value.

A corrosion damage caused by chlorides on stainless steel begins as small dark spots that can be difficult to detect.

1. Inspect closely for all types of damage by corrosion and record these observations carefully.
2. Polish dark-coloured spots and other corrosion marks with a fine grain emery cloth. This may prevent further damage.



DANGER

Disintegration hazard

Pits and spots forming a line may indicate cracks beneath the surface. All forms of cracks are a potential danger and are totally unacceptable.

Replace the part if corrosion can be suspected of affecting its strength or function.

Other metal parts

Separator parts made of materials other than steel, such as brass or other copper alloys, can also be damaged by corrosion when exposed to an aggressive environment. Possible corrosion damage can be in the form of pits and/or cracks.

5.3.4 Cracks

Cracks can initiate on the machine after a period of operation and propagate with time.

- Cracks often initiate in an area exposed to high cyclic material stresses. These are called fatigue cracks.
- Cracks can also initiate due to corrosion in an aggressive environment.
- Although very unlikely, cracks may also occur due to the low temperature embrittlement of certain materials.

The combination of an aggressive environment and cyclic stresses will speed-up the formation of cracks. Keeping the machine and its parts clean and free from deposits will help to prevent corrosion attacks.

DANGER

Disintegration hazard

All forms of cracks are potentially dangerous as they reduce the strength and functional ability of components.

Always replace a part if cracks are present.

It is particularly important to inspect for cracks in rotating parts and especially the pillars between the sludge ports in the bowl wall.

Always contact your Alfa Laval representative if you suspect that the largest depth of the damage exceeds 1,0 mm. Do not continue to use the separator until it has been inspected and cleared for operation by Alfa Laval.

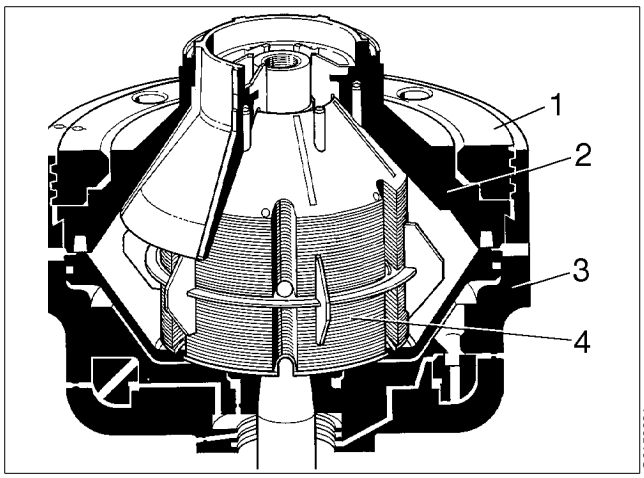
5.3.5 Disc stack pressure

NOTE

Ensure that the disc stack pressure is sufficient to maintain bowl balance.

Insufficient pressure in the disc stack can cause vibration and reduce lifetime of ball bearings.

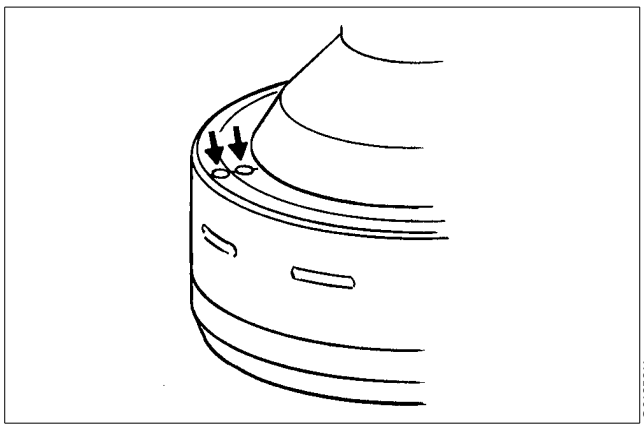
The lock ring (1) should press the bowl hood (2) firmly against the bowl body (3). The hood in turn should exert a pressure on the disc stack (4), clamping it in place.



1. *Lock ring*
2. *Bowl hood*
3. *Bowl body*
4. *Disc stack*

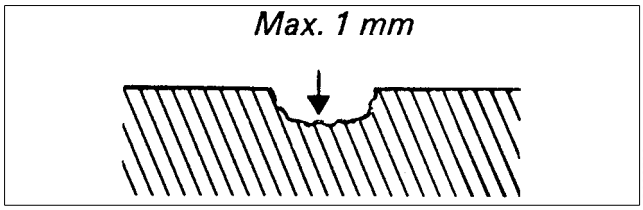
Correct pressure is obtained when it is possible to tighten the lock ring so far by hand that the ϕ-mark on the lock ring is positioned 30° - 60° before the mark on the bowl body.

To achieve this, add an appropriate number of discs to the top of the disc stack beneath the top disc.



5.3.6 Erosion

Erosion can occur when particles suspended in the process liquid slide along or strike against a surface. Erosion can become intensified locally by flows of higher velocity.



DANGER

Disintegration hazard

Inspect regularly for erosion damage. Inspect frequently if the process liquid is erosive.

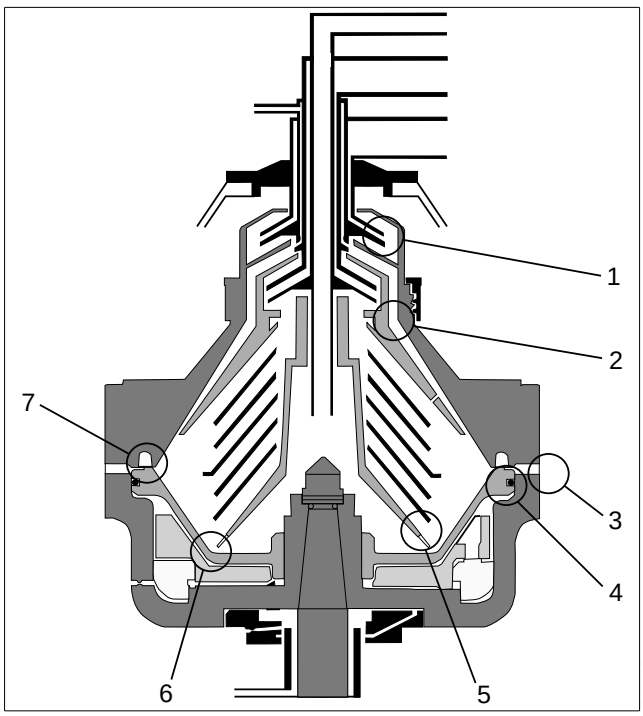
Always contact your Alfa Laval representative if the largest depth of any erosion damage exceeds 1,0 mm. Valuable information as to the nature of the damage can be recorded using photographs, plaster impressions or hammered-in lead.

Erosion is characterised by:

- Burnished traces in the material.
- Dents and pits having a granular and shiny surface.

Surfaces particularly subjected to erosion are:

1. The upper paring disc.
2. The top disc.
3. The pillars between the sludge ports in the bowl wall.
4. The sealing edge of the sliding bowl bottom.
5. The underside of the distributor in the vicinity of the distribution holes and wings.
6. The surface of the sliding bowl bottom that faces the conical part of the distributor.
7. The sealing edge of the sliding bowl bottom for the seal ring in the bowl hood.



Look carefully for any signs of erosion damage. Erosion damage can deepen rapidly and consequently weaken parts by reducing the thickness of the metal.

DANGER

Disintegration hazard

Erosion damage can weaken parts by reducing the thickness of the metal.

Pay special attention to the pillars between the sludge ports in the bowl wall.

Replace the part if erosion can be suspected of affecting its strength or function.

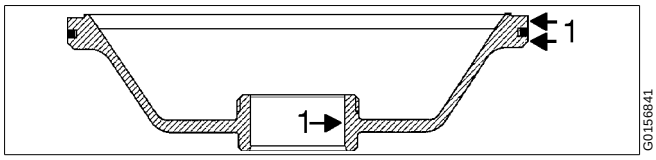
Wear and erosion liners in the bowl

The wear liners protect both the wall pillars in the bowl body and the sliding bowl bottom. They must be replaced before the liner has been perforated by erosion.

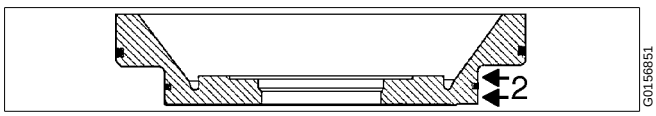
5.3.7 Guide surfaces

Check surfaces indicated (1) for burrs or galling. Rectify when necessary.

Repair of galling on guide surfaces; see following pages. Before fitting the sliding bowl bottom, clean (**do not** degrease) the contact surfaces (1 and 2). Apply Alfa Laval lubricating paste or Molykote 1000 Paste with a well-cleaned brush on surfaces (1 and 2).



Sliding bowl bottom



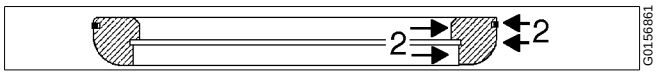
Distributing ring

NOTE

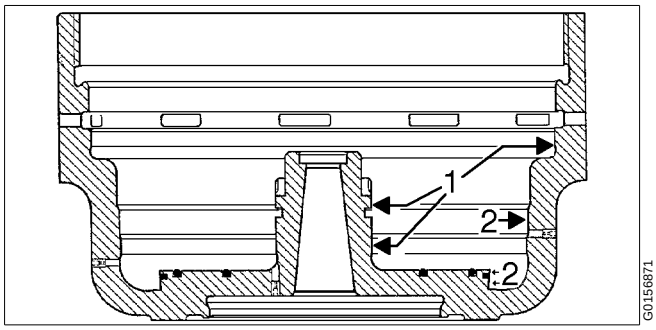
To avoid the risk of galling, the contact surfaces (1) should be primed with a slide lacquer at every Major Service.

The slide-lacquered surfaces will be destroyed if the surfaces are degreased.

Lubricate the O-ring and the seal ring with silicone grease making sure they are not damaged and lie properly in their grooves.



Operating slide



Bowl body

1, 2 =  *Alfa Laval lubricating paste or Molykote 1000 Paste*

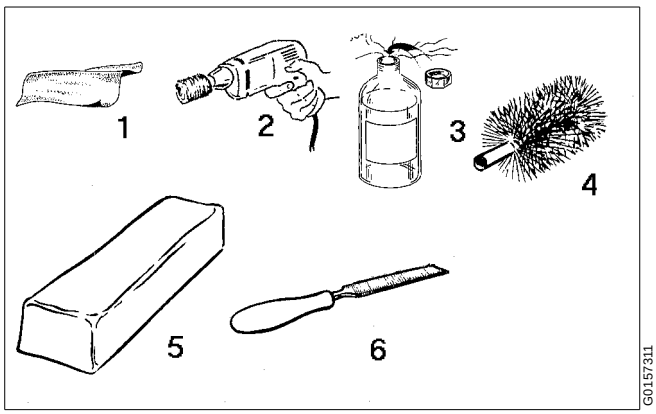
Repair of galling on guide surfaces

Galling (friction marks) may appear on guide surfaces in the operating system, the bowl body and the sliding bowl bottom.

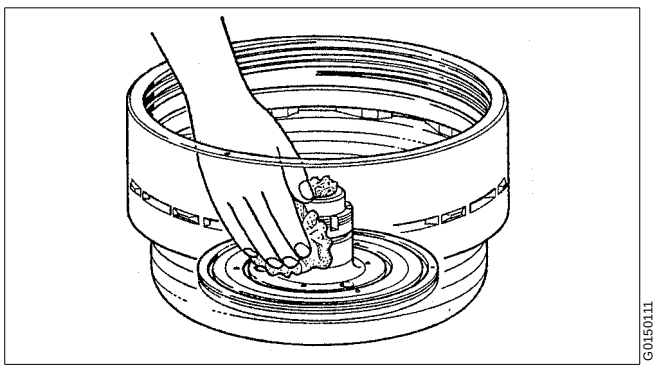
The example below describes the repair of the lower guide surface of the bowl body nave.

Recommended tools for correction of galling:

1. Emery cloth, 240 grade.
2. Hand drilling machine.
3. Degreasing agent.
4. Fibre brush, ∅ 25mm and ∅ 50 mm.
5. Brush wax (600 grade)
6. Very fine single-cut file.



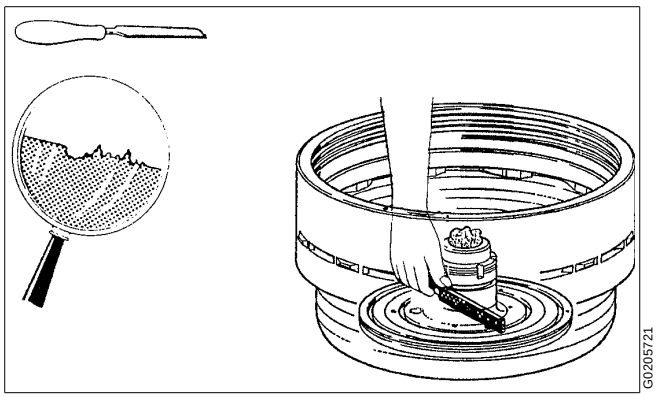
1. Clean the surface thoroughly with a degreasing agent, i.e. white spirit. This is important.



Degreasing

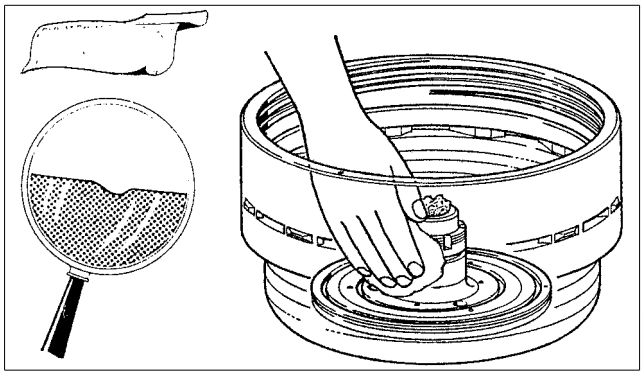
2. If the galling is excessive, first use the fine single-cut file. The file should be used with caution so that the damage is not made worse.

   Remove the high spots on the surface. Do not use rotating files or similar. Remove the high spots only - not the undamaged material.



Removing of high spots

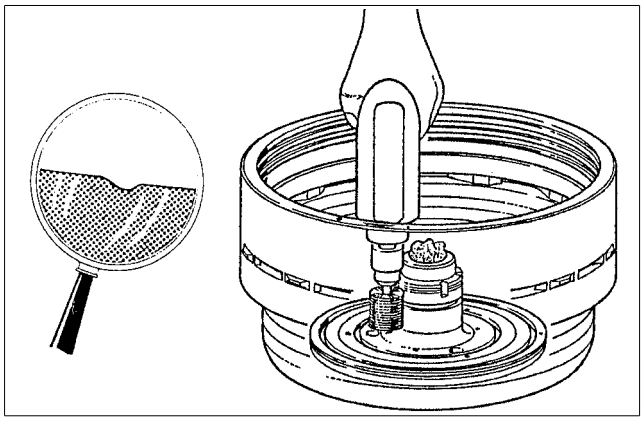
3. An emery cloth of 240 grade should be used to smooth the edges and to remove any burnt-in foreign matter.



Smoothing of edges

4. Finish off by polishing the damaged spot with the fibre brushes and brush wax. It is recommended that the whole area where galling may occur is polished. Polishing will help smoothen the whole of the damaged area, even in the deepest parts.

5. Prime the repaired area with lubricating spray Molykote 321 R. Read the correct procedure in chapter “5.4.8 Guide surfaces” on page 71.

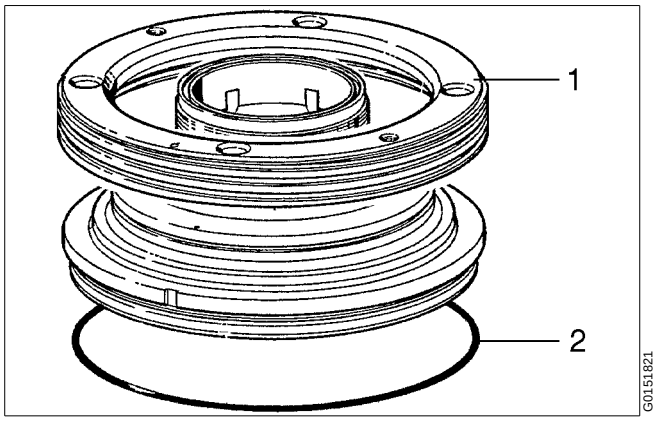


Polishing

5.3.8 Lock ring; wear and damage

Excessive wear or impact marks on threads, guide and contact surfaces of the lock ring, bowl hood and bowl body may cause hazardous galling.

Check the thread condition by tightening the lock ring (1) after removing the disc stack and bowl hood O-ring (2) from the bowl.



1. Lock ring
2. O-ring

DANGER

Disintegration hazards

Wear on large lock ring thread must not exceed safety limit. The ϕ-mark on lock ring must not pass opposite ϕ-mark by more than 25°.

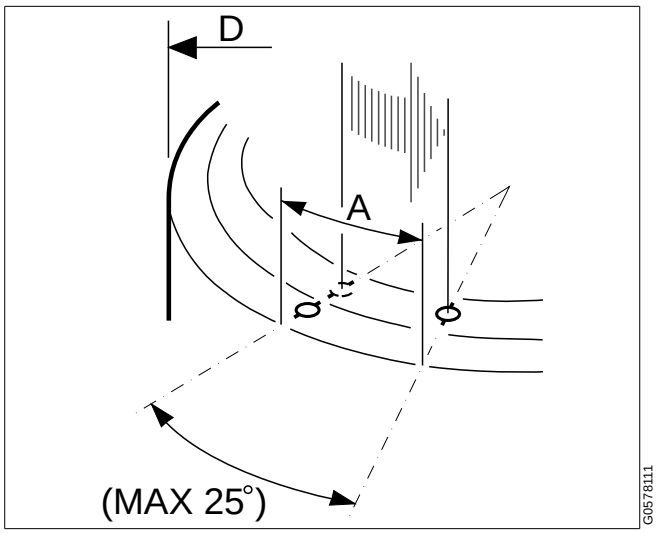
In a new bowl the alignment marks on the lock ring and the bowl body are exactly opposite each other.

If thread wear is observed, mark the bowl body at the new position of the alignment mark on the lock ring by punching in a new alignment mark.

If the original ϕ–mark on the lock ring passes the ϕ–mark on the bowl body by more than 25°, (A in the illustration) an Alfa Laval representative must be contacted immediately.

The measure A in millimetres (mm) is obtained by calculating bowl outside diameter D times 0,2.

If the marks become illegible, an Alfa Laval representative should be contacted immediately to inspect thread wear and for determining the position of new alignment marks.

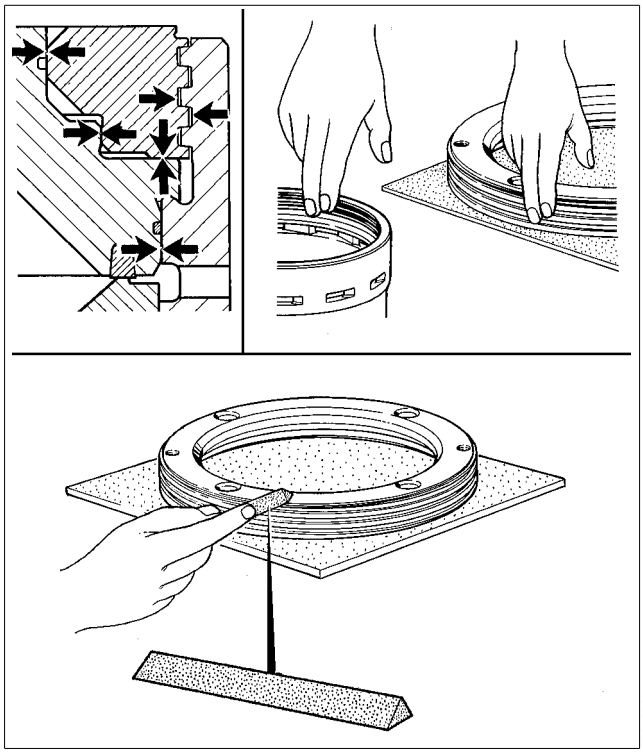


Damage

The position of the threads, contact and guide surfaces are indicated by arrows in the illustration.

Clean the threads, contact and guide surfaces with a suitable degreasing agent.

Check for burrs and protrusions caused by impact.



CAUTION

Cut hazards

Sharp edges on the threads may cause cuts.

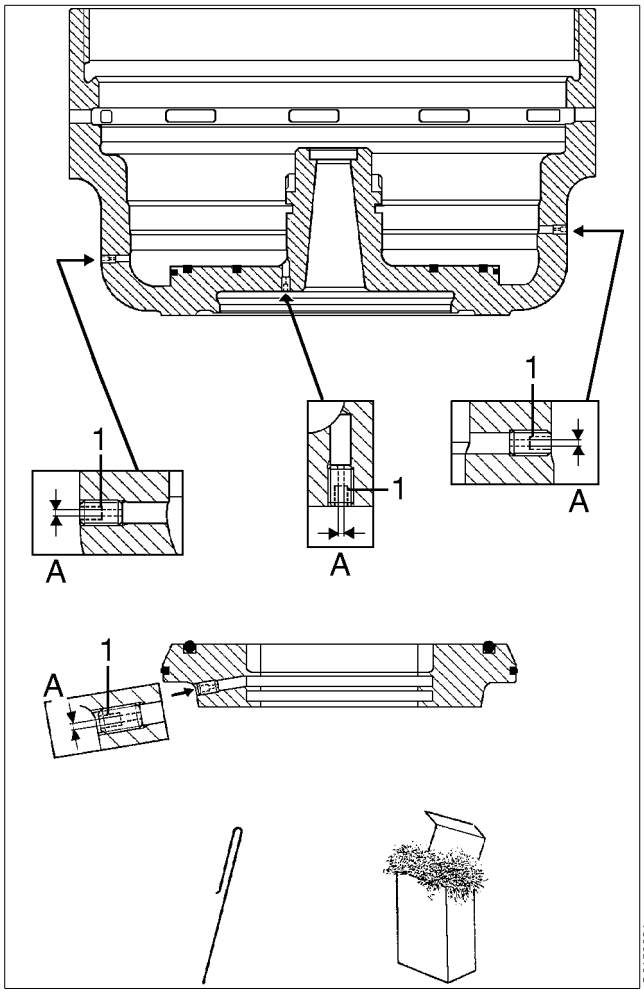
If damage is established, rectify using a whetstone or fine emery cloth (recommended grain size 240).

If the damage is considerable, use a fine single-cut file, followed by a whetstone.

5.3.9 Nozzles in bowl body and operating water ring

Clean nozzles (1) using soft iron wire or similar. Note that lime deposits can be dissolved in a 10% acetic acid solution heated to 80 °C.

Use Loctite 242 on the threads if the nozzles have been removed or replaced.



A = 1,5 mm

5.3.10 Inlet pipe

Check the threads on the inlet pipe and rectify if necessary.

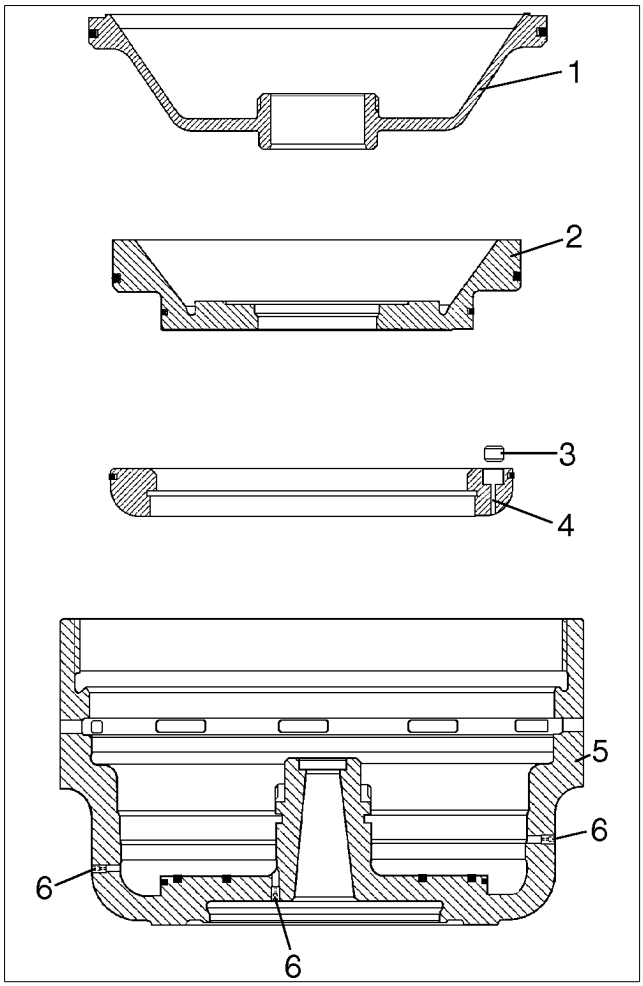
5.3.11 Operating mechanism

Dirt and lime deposits in the operating mechanism may cause poor discharge function or no function at all.

Clean and polish surfaces with steel wool if necessary.

Reasons for dirt or deposits:

- Hard or unclean operating water. Change water supply or install a water softener or a fine filter.
- Sludge has been sucked down into bowl casing and into the operating system. Check the installation and the venting system of both the sludge tank and bowl casing drain.



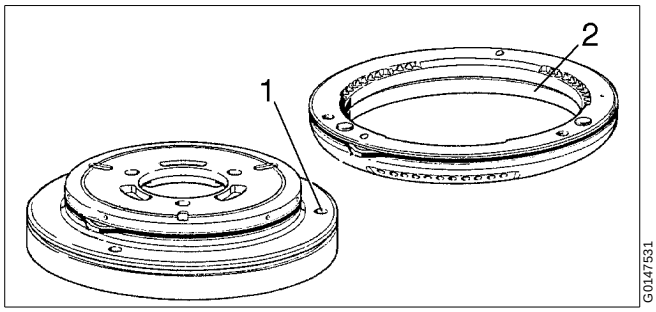
1. *Sliding bowl bottom*
2. *Distributing ring*
3. *Valve plug*
4. *Operating slide*
5. *Bowl body*
6. *Nozzles*

5.3.12 Operating slide

Poor sealing between the valve plugs on the operating slide and distributing ring may prevent complete closing of the bowl.

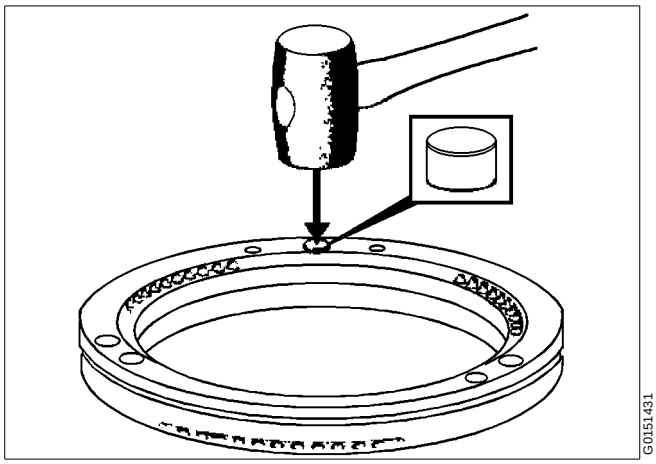
Examine the sealing surfaces (1) of the distributing ring in contact with the valve plugs. Remove any marks and lime deposits with a very fine grain emery cloth.

Check the guiding surface (2) in contact with the bowl body. Remove any marks with a whetstone (grain size 240).



Checking of sealing and guide surfaces

Remove all the valve plugs and tap in new ones. Correct height of valve plugs is 10 mm.

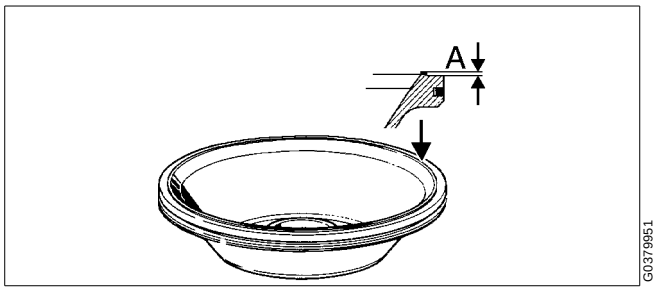


Fitting of new valve plugs

5.3.13 Sliding bowl bottom

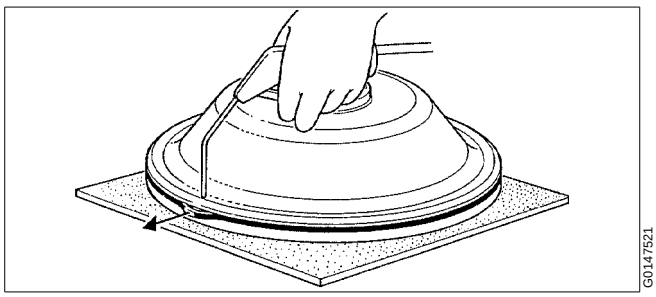
Poor sealing between the bowl hood seal ring and the sealing edge of the sliding bowl bottom will cause a leakage of process liquid from the bowl.

Check the sealing edge of the sliding bowl bottom. Maximum permissible reduction of the original profile height (2,0 mm) is 0,5 mm. If damaged either through corrosion or erosion or other means, contact an Alfa Laval representative.



A = minimum 1,5 mm

If the seal ring for the sliding bowl bottom is to be replaced, turn the sliding bowl bottom upside down and inject compressed air through the hole on the underside. This will press the ring outwards far enough to be gripped easily.

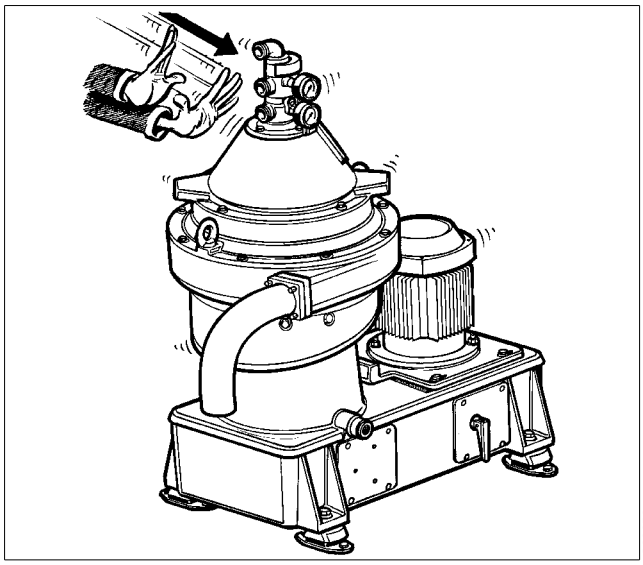


Removing of O-ring

5.3.14 Unbalance sensor (option)

Shake the separator from side to side to ensure that the unbalance alarm function is active.

Make sure that the separator control unit is on.



5.4 Check points at Major Service (MS)

5.4.1 Bowl hood seal ring

Same as described in chapter ‘‘5.3.1 Bowl hood seal ring” on page 49.

5.4.2 Bowl spindle cone and bowl body nave

Same as described in chapter ‘‘5.3.2 Bowl spindle cone and bowl body nave” on page 50.

5.4.3 Bowl spindle; radial wobble

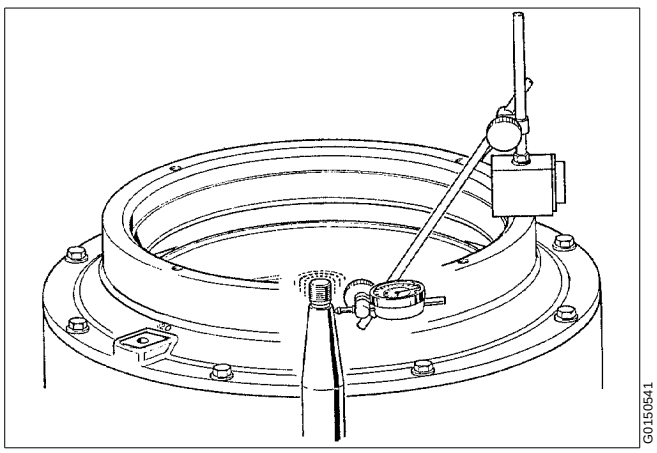
The bowl spindle wobble should be checked if the bowl spindle has been dismantled or if rough bowl running (vibration) occurs.

NOTE

Spindle wobble will cause rough bowl run. This leads to vibration and reduces lifetime of ball bearings.

1. Fit a dial indicator in a support and fasten it to the frame.
2. Rotate the spindle by hand.
3. Measure the wobble at the top of the tapered end of the spindle. Maximum permissible radial wobble is 0,04 mm.
4. If wobble is too large, renew all the ball bearings on the spindle.

Measure wobble after assembly. If it is still excessive, the spindle is probably damaged and must be replaced.



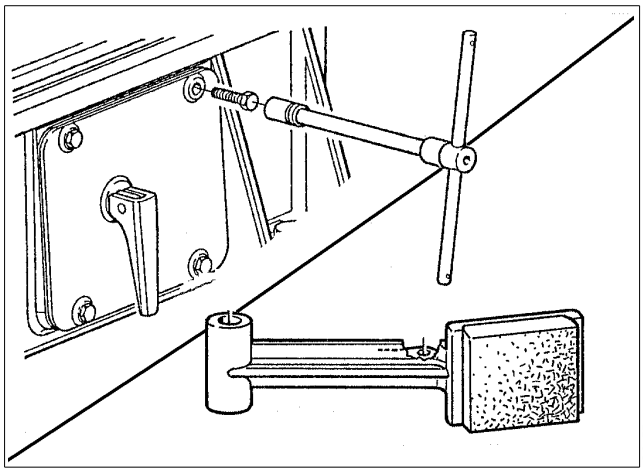
Maximum permissible radial wobble is 0,04 mm

5.4.4 Brake

Checking of friction element

A worn or oily friction element will lengthen the stopping time. Remove the cover together with the brake. Inspect the friction element.

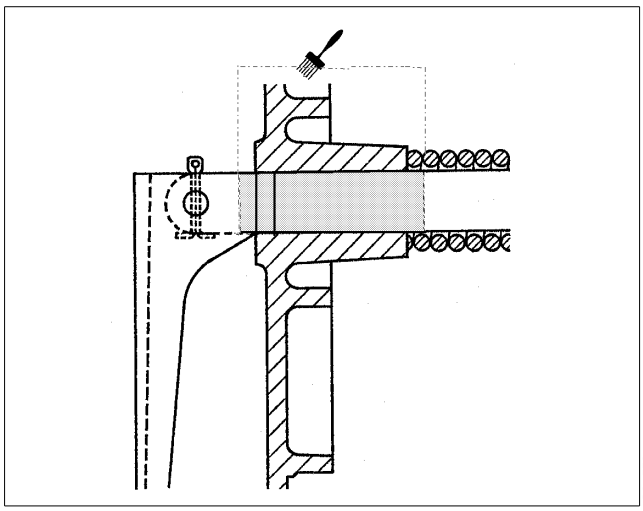
- If the friction element is worn: Replace the complete arm together with friction element.
- If the friction element is oily: Clean the element and its surfaces in contact with the belt pulley with a suitable degreasing agent.



Checking of cover, shaft and springs and

Rust can form on the brake parts and cause the brake to jam.

1. Remove any rust from the shaft and the corresponding guide surface on the cover.
2. Rub the surface of the shaft with lubricating paste along the area shown in the illustration.
3. Renew the springs if they have become weak. Oil the springs when assembling.

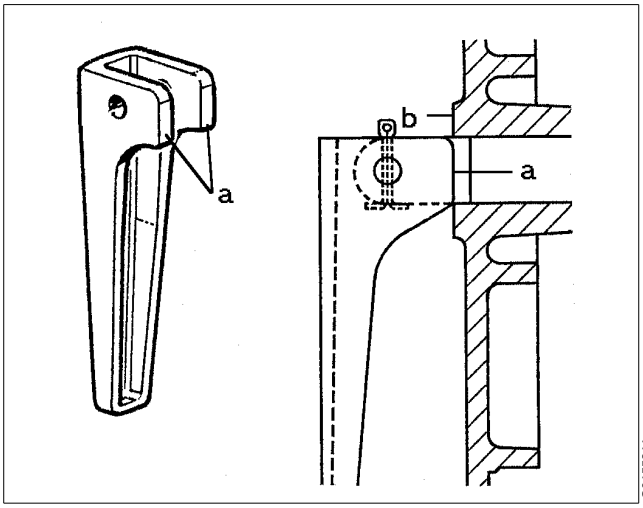


Alfa Laval lubricating paste or Molykote 1000 Paste

Checking of cover fitting

Incorrect position of the cover may cause a scraping noise.

1. Fit the cover.
2. Release the brake and rotate the bowl by hand by pulling the flat belt.



CAUTION

Crush hazards

Rotating the bowl by pulling the flat belt by hand may cause fingers to crush.

If a scraping noise is heard, the friction element is probably touching the motor belt pulley. The surface (a) on the handle is not in flush with surface (b) on the cover.

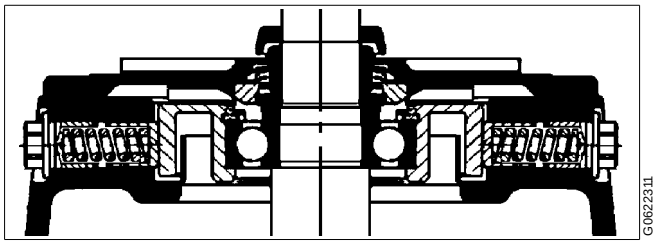
3. Loosen the cover and fit correctly.

NOTE

Not following the instructions in chapter “6.5 Flat belt’’ may cause bad function of the flat belt transmission.

5.4.5 Buffer, buffer springs and bearing seat

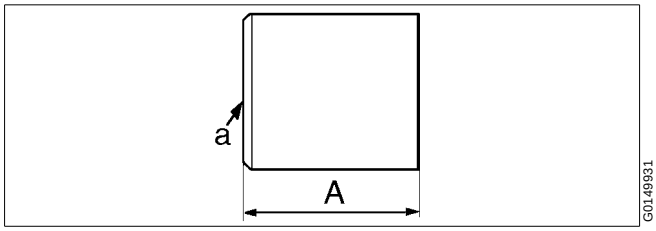
Weakened or broken buffer springs or defective contact surfaces for the buffers on the bearing seat may give rise to separator vibration (rough bowl run).



Upper bearing housing

Buffer

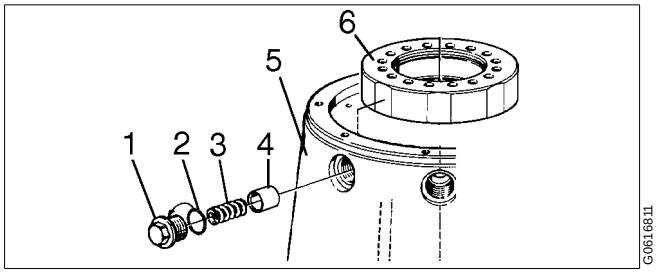
Inspect the buffers. If any one is worn down to a total length of 29,5 mm or less, or if more than half of a buffer surface (a) that is in contact with bearing seat is covered with small cavities (pittings), renew the complete set of buffers.



A = minimum 29,5 mm

Top bearing springs

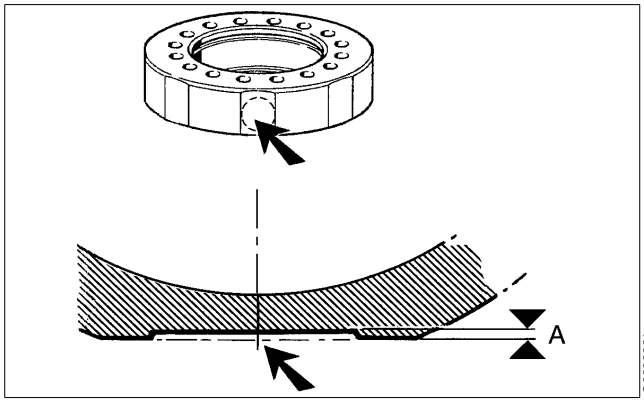
In case of spring fracture, the complete set of springs should be replaced, even if only one spring is broken.



1. *Screw plug*
2. *O-ring*
3. *Spring*
4. *Buffer*
5. *Frame bottom part*
6. *Bearing seat*

Bearing seat

Examine the contact surface for the buffers on the bearing seat. In case of defects (indentations deeper than 0,5 mm), renew the bearing seat as well as buffers and springs.



A = maximum 0,5 mm

5.4.6 Coupling friction blocks

Worn or oily pads in the coupling will cause a long acceleration period.

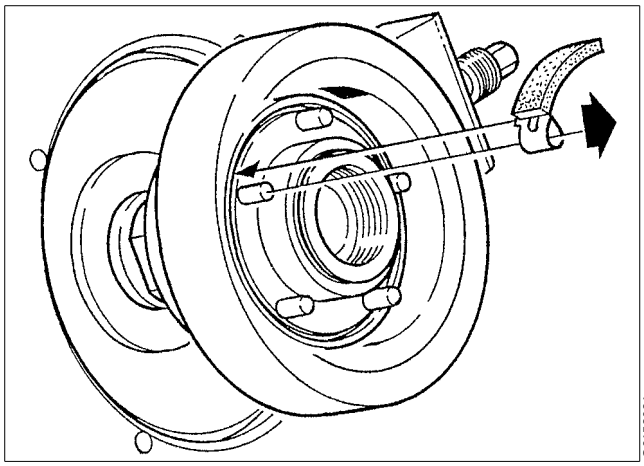
If the separator does not attain full speed within about 5 minutes or the bowl lose speed during operation, the friction pads of the coupling may be worn or oily. Check the pads.

If the pads are oily:

- Clean the pads and the inside of the belt pulley with a suitable degreasing agent. Roughen the friction surfaces of the pads with a coarse file.

If the pads are worn:

- Fit new friction blocks.



Check the friction pads

NOTE

Replace all blocks even if only one is worn.

5.4.7 Disc stack pressure

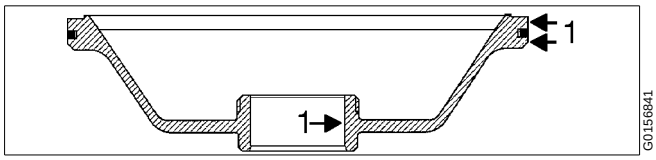
Same as described in chapter “5.3.5 Disc stack pressure” on page 54.

5.4.8 Guide surfaces

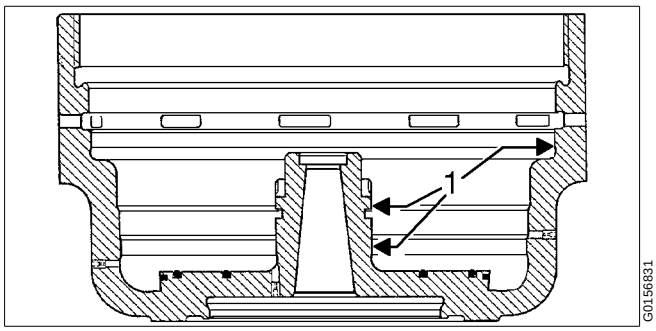
Check surfaces indicated (1) for burrs or galling. Rectify when necessary.

Repair of galling on guiding surfaces, see chapter “5.3.7 Guide surfaces” on page 57.

1. Mask the nave hole of the bowl body. Slide lacquer must not enter this hole.
2. Carefully degrease the contact surfaces (1) between the sliding bowl bottom and bowl body. Dry the surfaces well.
3. Apply slide lacquer Molykote D321R with a well cleaned brush. Protect the surfaces which should not be treated.
4. Air-cure the treated surfaces for 15 minutes.
5. Use a smooth fibre brush to polish to an even, homogeneous contact film.
6. Apply slide lacquer a second time.
7. Air-cure the lacquer for a further 15 minutes.
8. Polish the film to a shiny surface. The film should look like well-polished leather when properly done.
9. Finish the treatment by lubricating the contact surfaces (1) with Alfa Laval lubricating paste or Molykote 1000 Paste. Use a well-cleaned brush. Rub it into the surface, do not leave any excessive paste.
10. Lubricate the O-ring and the seal ring with silicone grease and check that they lie properly in their grooves.



Sliding bowl bottom



Bowl body

5.4.9 Height position of oil paring disc

The height position should be checked if the bowl spindle has been dismantled or the bowl has been replaced.

1. Assemble the bowl and the inlet and outlet device but not the outlet housing, inlet and outlet housing, nut, inlet bend and safety device.

   Make sure that the screws for the connecting housing are properly tightened.

2. Measure the height “A” (should be 182,5 mm) as showed in the illustration. Adjust the distance by adding or removing height adjusting rings (2) under the connecting housing (1).

3. Fit the connecting housing and assemble the inlet and outlet device.

4. Rotate the bowl spindle by pulling the flat belt by hand.

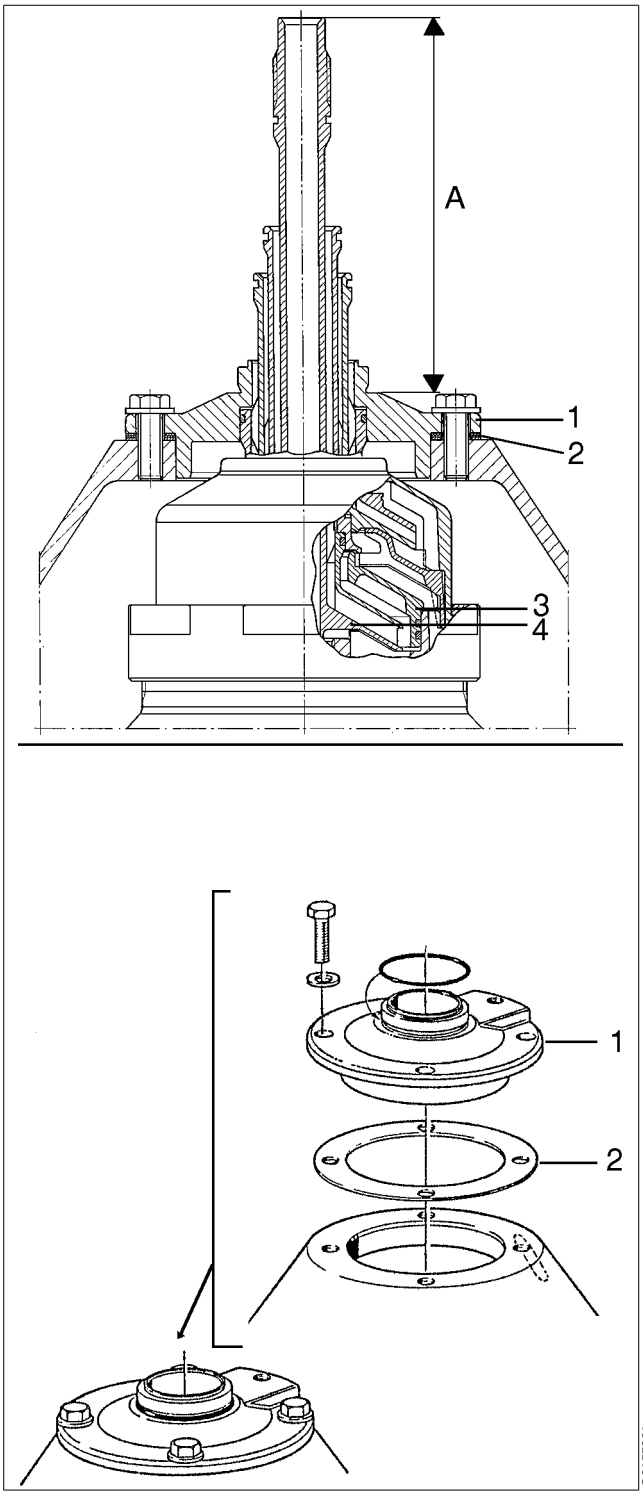
CAUTION

Crush hazards

Rotating the bowl by pulling the flat belt by hand may cause fingers to be crushed.

If it does not rotate freely or if a scraping noise is heard, incorrect height adjustment or incorrect fitting of the inlet pipe can be the cause.

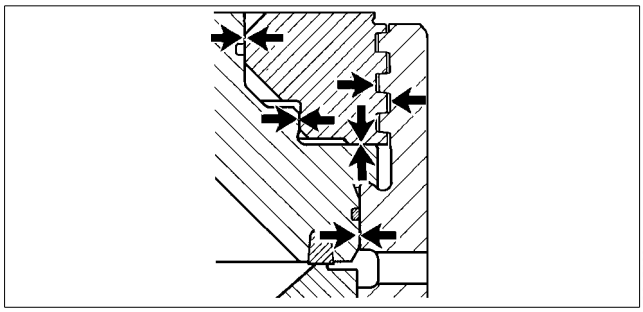
The noise is caused by the oil paring disc (4) scraping against the paring chamber cover (3).



A=182,5 mm

5.4.10 Lock ring; priming

The arrows indicate positions of threads, guide and contact surfaces to be primed.

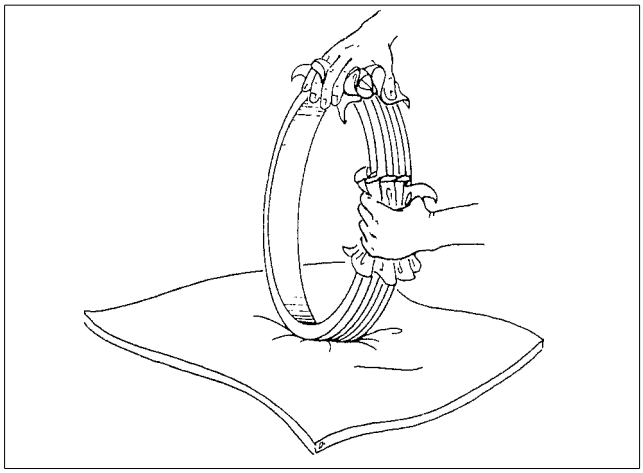


Priming positions

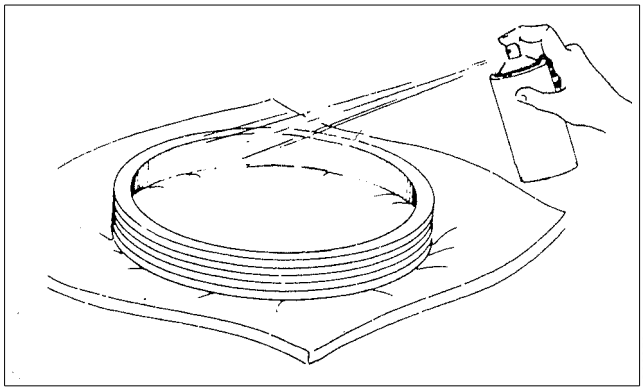
Recommended agents for priming procedure:

- Degreasing agent
- Lubricating spray Molykote 321 R
- Hand drilling machine
- 2 fibre brushes

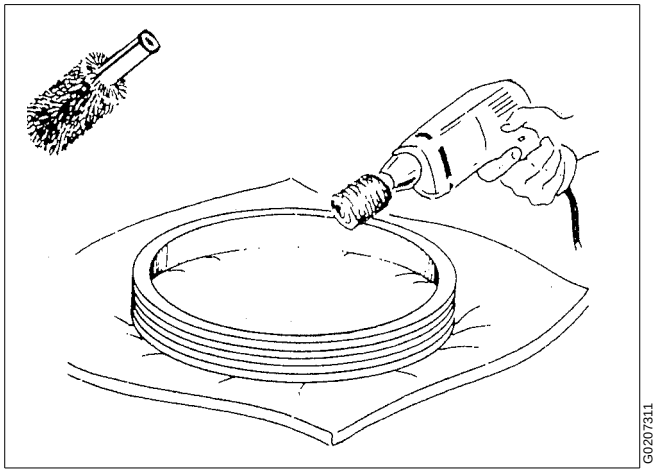
1. Clean the lock ring thoroughly with a degreasing agent and wipe it off.



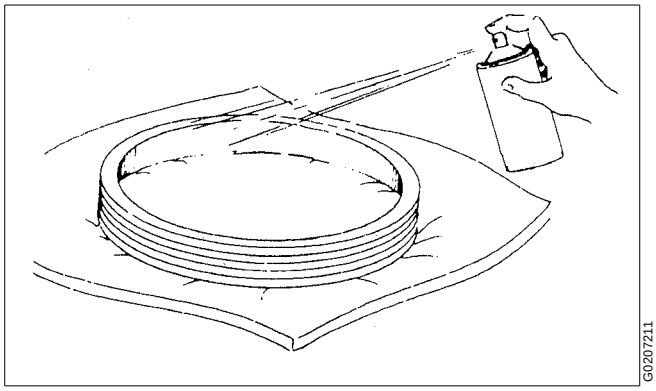
2. Spray the threads, guide and contact surfaces with slide lacquer Molykote 321 R. Let the lacquer air-cure for about 15 minutes.



3. Use a fibre brush to polish the slide lacquer into the surface. The black spray will look like well-polished leather when properly done.

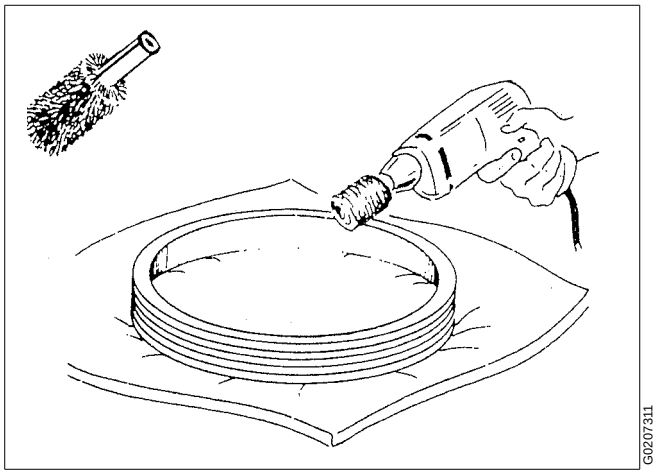


4. Spray the lock ring a second time and let it dry for about 15 minutes.



5. Polish the slide lacquer to a black shiny surface which can now last about a year.

   Proceed in the same way with the threads of the bowl body and with the guide surfaces of bowl body - bowl hood and bowl hood - lock ring.



5.4.11 Lock ring; wear and damage

Same as described in chapter “5.3.8 Lock ring; wear and damage” on page 60.

5.4.12 Inlet pipe

Same as described in chapter “5.3.10 Inlet pipe” on page 62.

5.4.13 Operating mechanism

Same as described in chapter “5.3.11 Operating mechanism” on page 63.

5.4.14 Operating slide

Same as described in chapter “5.3.12 Operating slide” on page 64.

5.4.15 Sliding bowl bottom

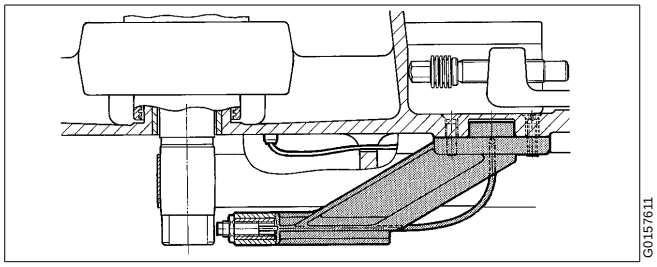
Same as described in chapter “5.3.13 Sliding bowl bottom” on page 64.

5.4.16 Speed sensor (option)

Correct positioning

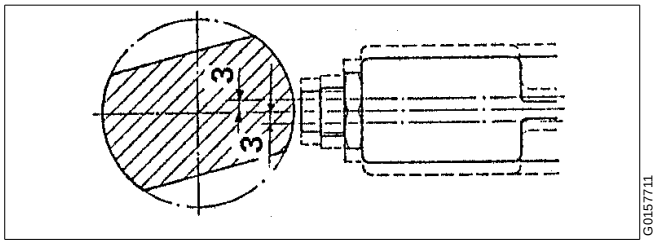
Incorrect fitting of the speed sensor can cause faulty speed monitoring.

Fitting must be checked whenever the speed sensor has been removed or renewed.



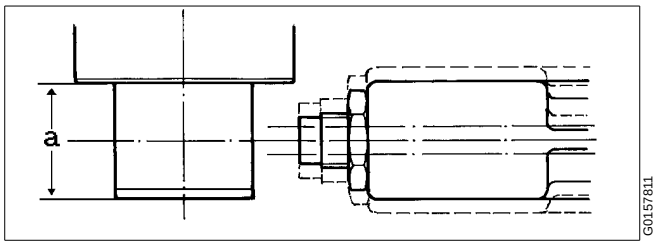
1. Check that the speed sensor head is directly in line with the centre line of the bowl spindle.

   Maximum deviation ±3 mm. Use a mirror when checking.

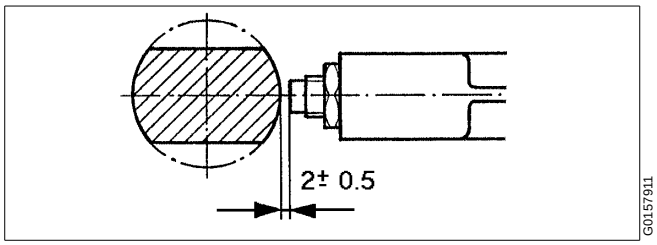


2. Check that the height is correct.

   The sensor head must be positioned within the area (a) of the bowl spindle.



3. Check that the distance between the speed sensor head and the bowl spindle is 2 ±0,5 mm.



All dimensions in mm

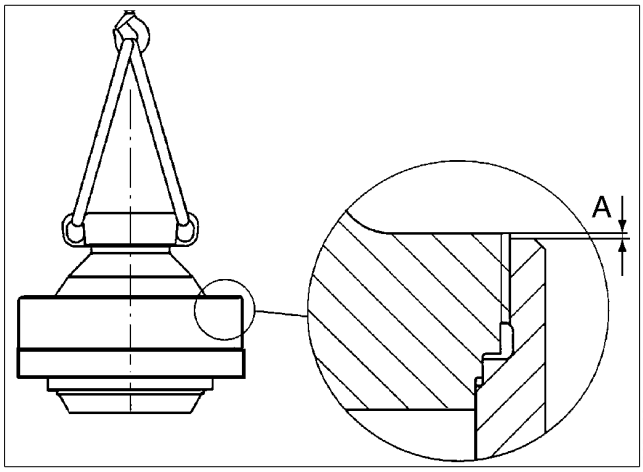
NOTE

If the distance between the speed sensor head and the bowl spindle deviates from the above measurements, replace the speed sensor or contact an Alfa Laval representative.

5.5 Lifting

1. Remove the bowl according to the instructions in chapter “6.2 Inlet/outlet, frame hood and bowl” on page 96.

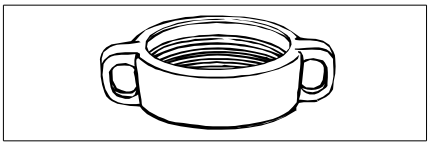
   When lifting the bowl, use the lifting tool fastened on the bowl hood.



A = maximum 2 mm

NOTE

Weight of bowl is approximately 150 kg.



Before lifting the bowl, check that the large lock ring has been screwed home into the bowl body. Less than 2 mm of bowl hood threading must remain above the bowl body edge.

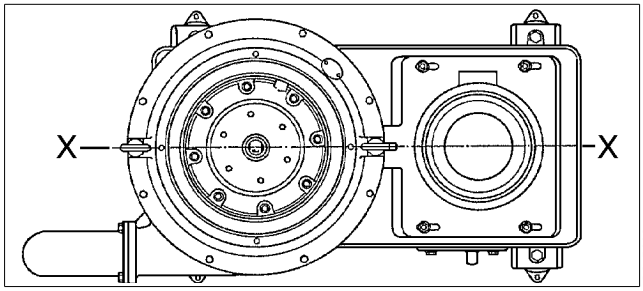
2. Disconnect the motor cables.
3. Tighten the frame hood.
4. Fit the lifting eyes.

CAUTION

Crush hazards

The lifting bolts must always be positioned along the x - x axis of the separator (see illustration). Frame ring must stay in its original position irrespective of the position of the frame top part.

If the frame ring has been removed apply Loctite 242 on its screws before tightening. Tightening torque: 45Nm ±5 Nm.



Positioning of the lifting bolts

WARNING

Crush hazards

Use only the two **special lifting eyes** (M20) for lifting the machine. They are to be screwed into the special threaded holes on the frame ring.

Other holes are **not** dimensioned for lifting the machine.

A falling separator can cause accidents resulting in serious injury to persons and damage to equipment.

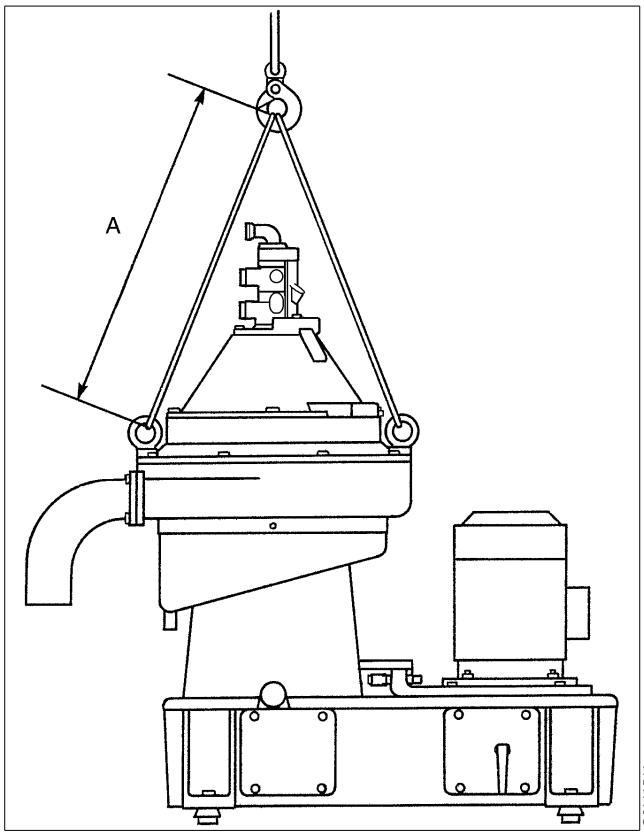
5. Use two endless slings to lift the separator. Length of each sling: minimum 2 metres. Thread the slings through the lifting eyes and fit them to the hook of the hoist.
6. Unscrew the foundation bolts.
7. When lifting and moving the separator, obey normal safety precautions for lifting large heavy objects.

NOTE

Machine weight without bowl is approximately 530 kg.

Do not lift the separator unless the bowl has been removed.

8. Remove the lifting eyes afterwards.



A = minimum 1 metre

5.6 Cleaning

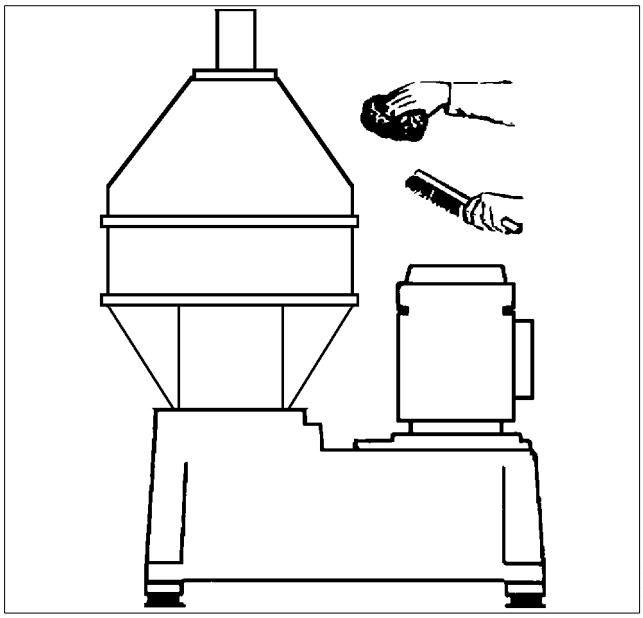
5.6.1 External cleaning

The external cleaning of the frame and motor should be restricted to brushing, sponging or wiping while the motor is running or is still hot.

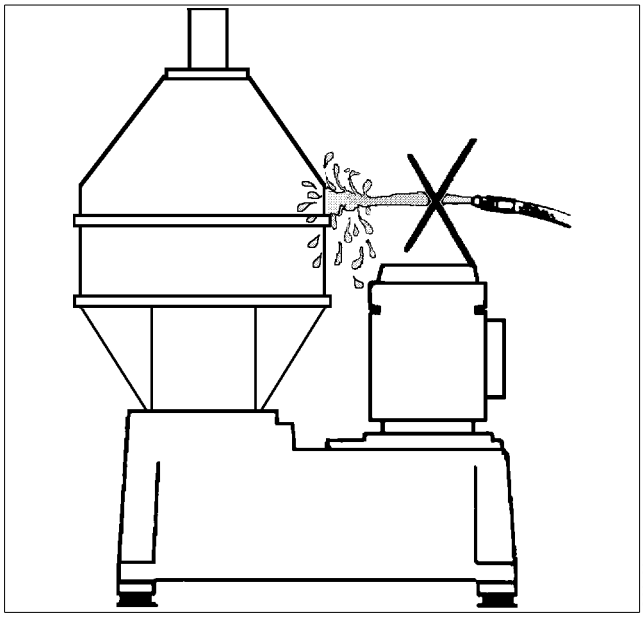
Never wash down a separator with a direct water stream. Totally enclosed motors can be damaged by direct hosing to the same extent as open motors and even more than those, because:

- Many operators believe that these motors are sealed, and normally they are not.
- A water jet played on these motors will produce an internal vacuum, which will suck the water between the metal-to-metal contact surfaces into the windings, and this water cannot escape.
- Water directed on a hot motor may cause condensation resulting in short-circuiting and internal corrosion.

Be careful even when the motor is equipped with a protecting hood. Never play a water jet on the ventilation grill of the hood.



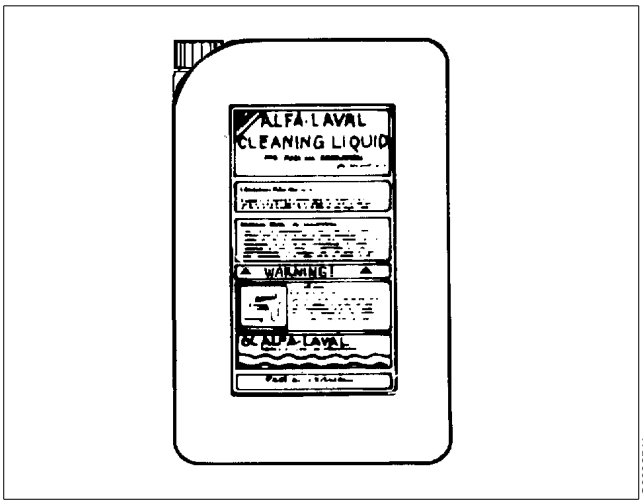
Use a sponge or cloth and brush when cleaning



Never wash down a separator with a direct water stream. Never play a water jet on the motor.

5.6.2 Cleaning agents

When using chemical cleaning agents, make sure you follow the general rules and suppliers' recommendations regarding ventilation, protection of personnel, etc.



Alfa Laval cleaning liquid for lube oil and fuel oil separators is available in 25-litres plastic containers

For separator bowl, inlet and outlet

A chemical cleaning agent must dissolve the deposits quickly without attacking the material of the separator parts.

- For cleaning of *lube oil* separators the most important function of the cleaning agent is to be a good solvent for the gypsum in the sludge. It should also act as a dispersant and emulsifier for oil. It is recommended to use Alfa Laval cleaning liquid for lube oil separators which has the above mentioned qualities. Note that carbon steel parts can be damaged by the cleaning agent if submerged for a long time.
- *Fuel oil* sludge mainly consists of complex organic substances such as asphaltenes. The most important property of a cleaning liquid for the removal of fuel oil sludge is the ability to dissolve these asphaltenes.

  Alfa Laval cleaning liquid for fuel oil separators has been developed for this purpose. The liquid is water soluble, non-flammable and does not cause corrosion of brass and steel. It is also gentle to rubber and nylon gaskets in the separator bowl.

  Before use, dilute the liquid with water to a concentration of 3-5%. Recommended cleaning temperature is 50-70 °C.

CAUTION

Skin irritation hazard

Read the instructions on the label of the plastic container before using the cleaning liquid.

Always wear safety goggles, gloves and protective clothing as the liquid is alkaline and dangerous to skin and eyes.

For operating mechanism

Use 10% acetic acid solution to dissolve lime deposits. The acid should be heated to 80°C.

For parts of the driving devices

Use white spirit, cleaning-grade kerosene or diesel oil.

Oiling (protect surfaces against corrosion)

Protect cleaned carbon steel parts against corrosion by oiling. Separator parts that are not assembled after cleaning must be wiped and coated with a thin layer of clean oil and protected from dust and dirt.

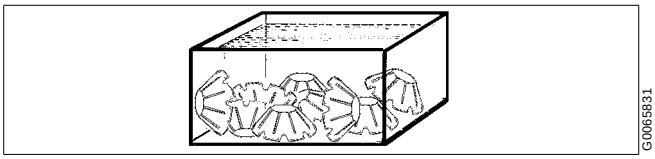
5.6.3 Cleaning of bowl discs

Bowl discs

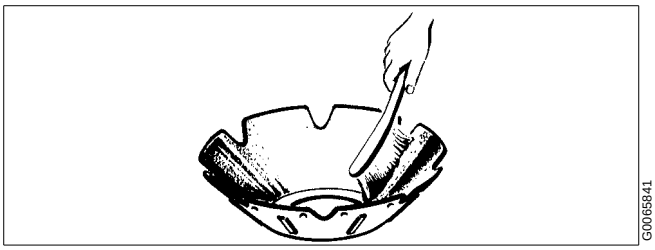
Handle the bowl discs carefully so as to avoid damage to the surfaces during cleaning.

> **NOTE**
>
> Mechanical cleaning is likely to scratch the disc surfaces causing deposits to form quicker and adhere more firmly.
>
> A gentle chemical cleaning is therefore preferable to mechanical cleaning.

1. Remove the bowl discs from the distributor and lay them down, **one by one**, in the cleaning agent.
2. Let the discs remain in the cleaning agent until the deposits have been dissolved. This will normally take between two and four hours.
3. Finally clean the discs with a SOFT brush.



Put the discs one by one into the cleaning agent



Clean the discs with a soft brush

5.6.4 CIP-system

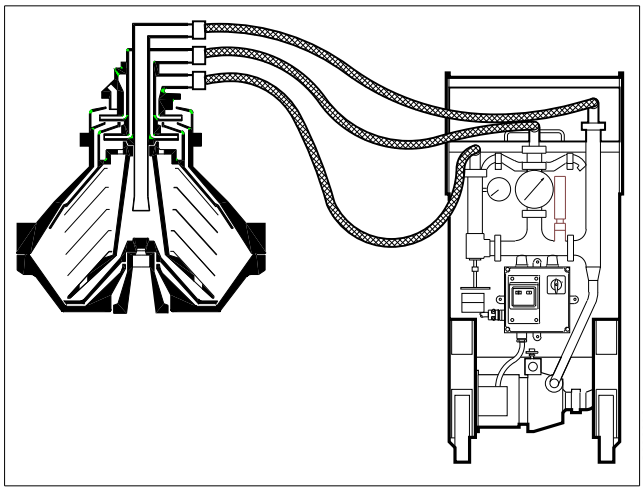
Alfa Laval has developed a CIP (Cleaning-In-Place) system specifically designed for cleaning the bowl and with the inlet and outlets of lube and fuel oil separators without the need of dismantling.

The Alfa Laval CIP System is designed to pump a suitable cleaning liquid through all spaces and channels of the bowl at very high speed. The high flow rate necessary to effectively wash these parts is obtained by using the separator paring discs as pumps.

As the method is simple, it can be performed more often than manual cleaning, thereby increasing the separation efficiency as well as reliability and reducing wear of components due to frequent dismantling.

The CIP System consists of a CIP Unit and cleaning liquids, which are different for lube oil and fuel oil separators.

The special Alfa Laval cleaning liquid fulfils the requirements for the cleaning of separators. It is not dangerous to handle and does not corrode bronze parts.



CIP Unit connected to separator

5.7 When changing oil

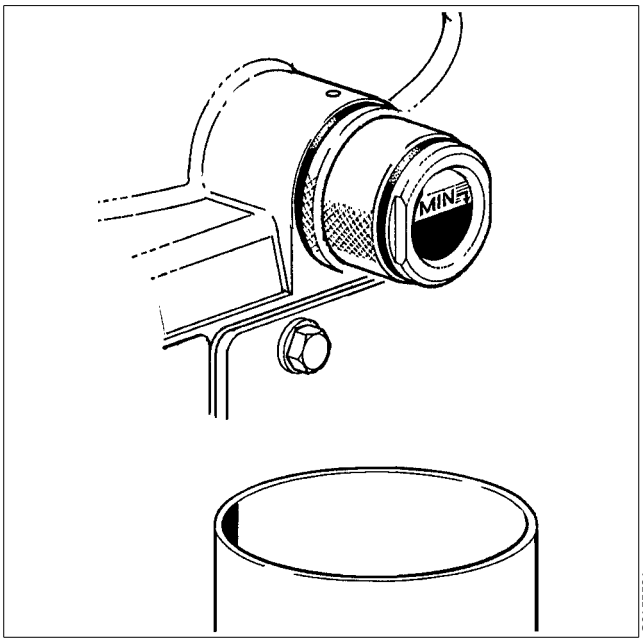
5.7.1 Oil change procedure

The separator should be level and at standstill when oil is filled or the oil level is checked. At standstill the oil level is lower than in operation. The MIN-line refers to the oil level at standstill.

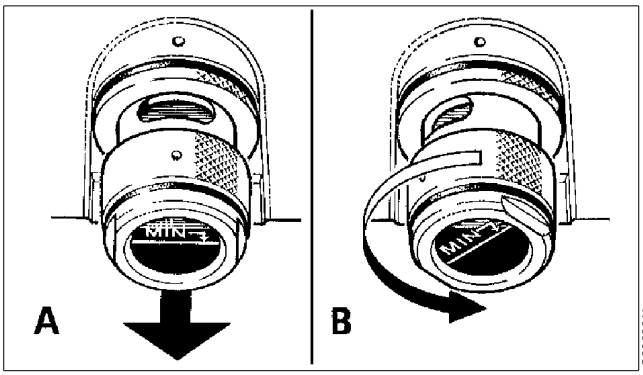
NOTE

Before adding or renewing lubricating oil in the worm gear housing, the information concerning different oil groups, handling of oils, oil change intervals etc. given in chapter “8.5 Lubricants” on page 188.

1. Put a vessel under the oil filling device.



2. Pull out (A) the oil filling device and turn it half a turn (B).

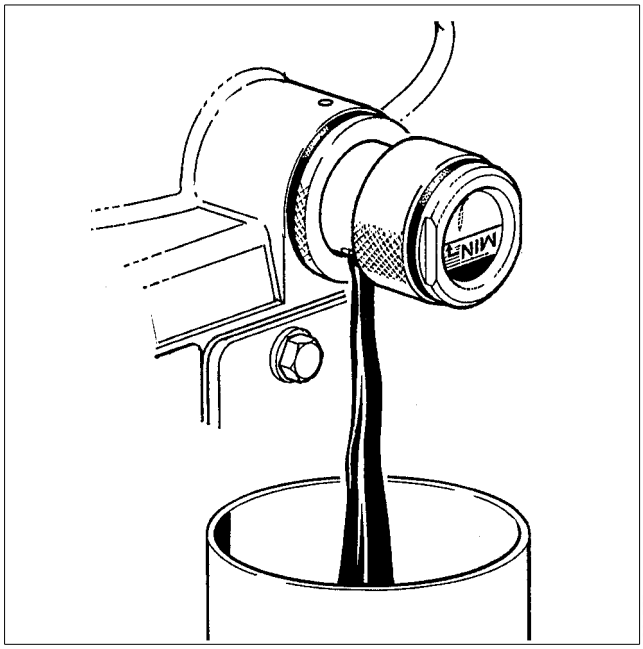


CAUTION

Burn hazards

Lubricating oil and various machine surfaces can be sufficiently hot to cause burns.

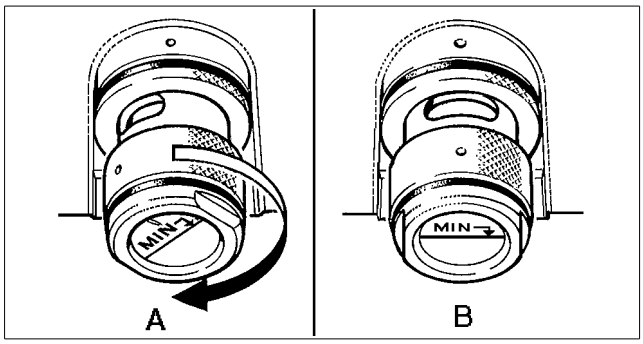
3. Collect the oil.



NOTE

When changing from one oil group to another, the oil sump and the spindle parts must first be thoroughly cleaned.

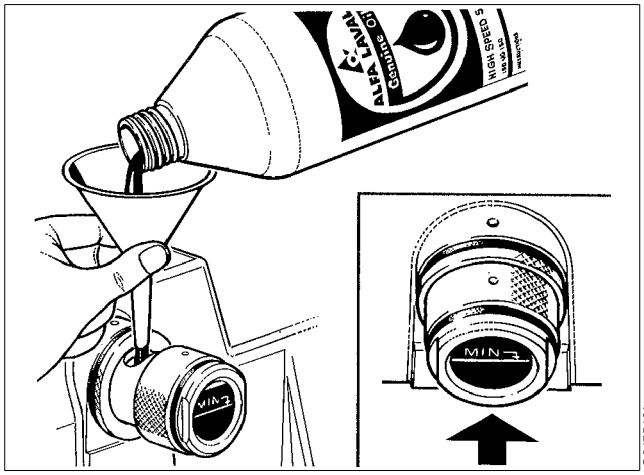
4. Turn (A) the oil filling device back to the position (B).



5. Fill the oil sump with new oil. The oil level should be exactly in the middle of the sight glass.

   Oil volume: approximately 2 litres.

6. Push in the oil filling device.



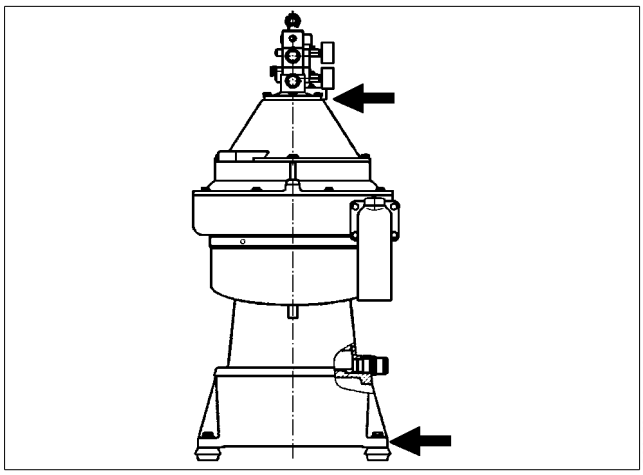
Oil volume 2 litres

5.8 Vibration

5.8.1 Vibration analysis

Excessive vibration or noise indicates that something is incorrect. Stop the separator and identify the cause.

Use vibration analysis instrument to periodically check and record the level of vibration. See the illustration where to take measurements. The level of vibration should not exceed 9,0 mm/s.



Measuring points for vibration analysis

DANGER

Disintegration hazards

If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.

The cause of the vibration must be identified and corrected before the separator is restarted. Excessive vibration can be due to incorrect assembly or poor cleaning of the bowl.

5.9 Unbalance sensor (optional)

The unbalance sensor is optional and delivered as a complete unit.

In the case of incorrect operation, replace the complete unbalance sensor. The unbalance sensor should not be adjusted.

To replace the sensor, see chapter ‘‘6.10.1 Mounting” on page 164.

If the unbalance sensor is not installed at delivery, see chapter ‘‘6.10.1 Mounting” on page 164 and chapter ‘‘8.6 Drawings” on page 195.

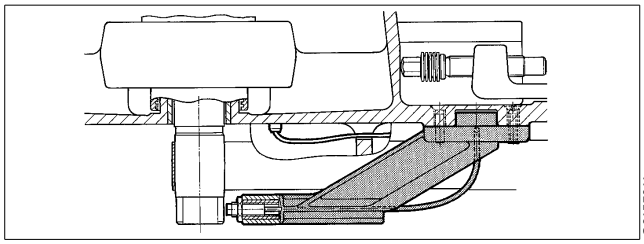
5.10 Speed sensor (optional)

The speed sensor is optional and delivered as a complete unit.

If the sensor has been damaged or if the current is outside the specified limits replace the complete speed sensor . The speed sensor should not be adjusted.

To replace the sensor, see chapter “6.9.2 Mounting” on page 160.

If the speed sensor is not installed at delivery, see chapter “6.9.2 Mounting” on page 160 and chapter “8.6 Drawings” on page 195.



5.11 Common maintenance directions

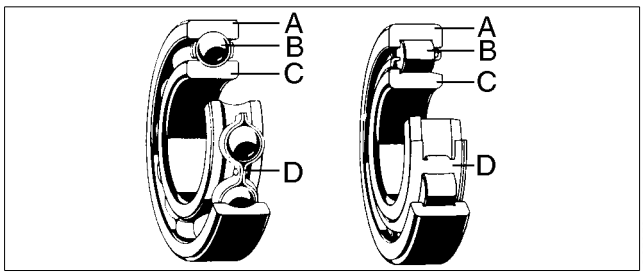
5.11.1 Ball and roller bearings

Special-design bearings for the bowl spindle

The bearings used for the bowl spindle are special to withstand the speed, vibration, temperature and load characteristics of high-speed separators.

Only Alfa Laval genuine spare parts should be used.

A bearing that in appearance looks equivalent to the correct may be considerably different in various respects: inside clearances, design and tolerances of the cage and races as well as material and heat treatment.



A. Outer race
B. Ball/roller
C. Inner race
D. Cage

NOTE

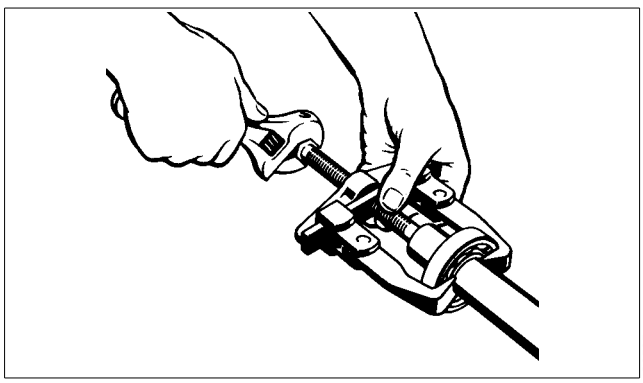
Using an incorrect bearing can cause a serious breakdown with injury to personnel and damage to equipment as a result.

Do not re-fit a used bearing. Always replace it with a new one.

Dismantling

Remove the bearing from its seat by using a puller. If possible, let the puller engage the inner ring, then remove the bearing with a steady force until the bearing bore completely clears the entire length of the cylindrical seat.

The puller should be accurately centered during dismantling; otherwise, it is easy to damage the seating.



NOTE

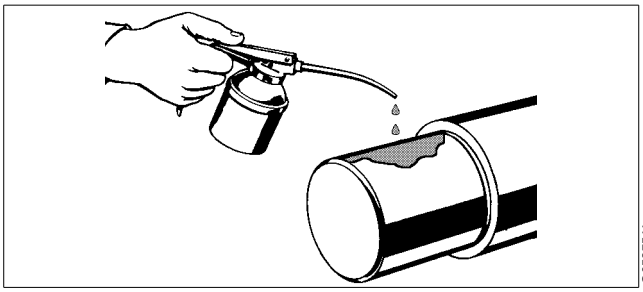
Do not hit with a hammer directly on the bearing.

Cleaning and inspection

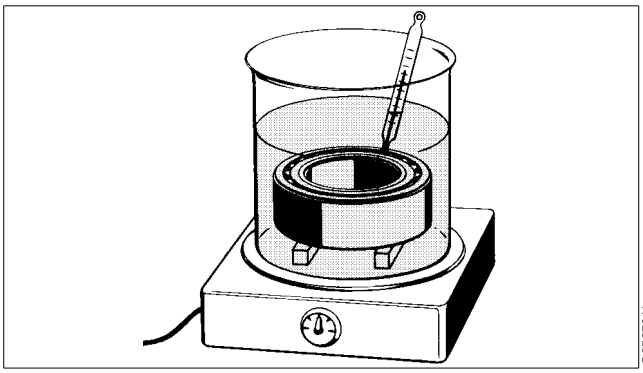
Check shaft (spindle) end and/or bearing seat in the housing for damage indicating that the bearing has rotated on the shaft (spindle) and/or in the housing respectively. Replace the damaged part, if the faults cannot be remedied by polishing or in some other way.

Assembly

- Leave new bearings in original wrapping until ready to fit. The anti-rust agent protecting a new bearing should not be removed before use.
- Use the greatest cleanliness when handling the bearings.
- To facilitate assembly and also reduce the risk of damage, first clean and then lightly smear the bearing seating on shaft (spindle) or alternatively in housing, with a thin oil.



- When assembling ball bearings, the bearings must be heated in oil to max 125 °C.



NOTE

Heat the bearing in a clean container with a cover.

Use only clean oil with a flash point above 250 °C.

The bearing must be well covered by the oil and not be in direct contact with the sides or the bottom of the container. Place the bearing on some kind of support or suspended in the oil bath.

- There are several basic rules for assembling cylindrical bore bearings:

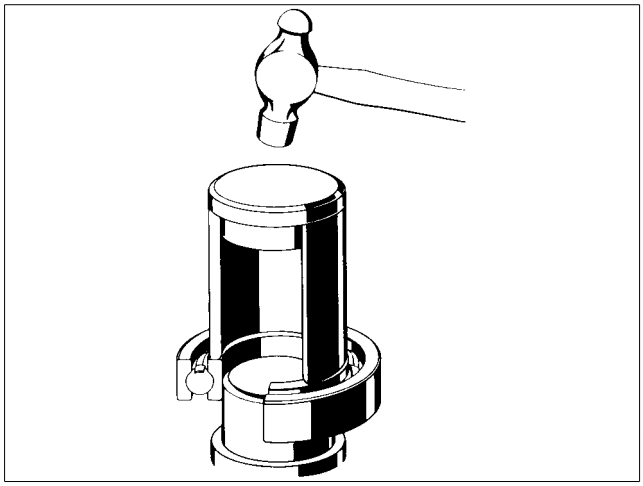
  - Never directly strike a bearing's rings, cage or rolling elements while assembling. A ring may crack or metal fragments break off.

  - Never apply pressure to one ring in order to assemble the other.

  - Use an ordinary hammer. Hammers with soft metal heads are unsuitable as fragments of the metal may break off and enter the bearing.

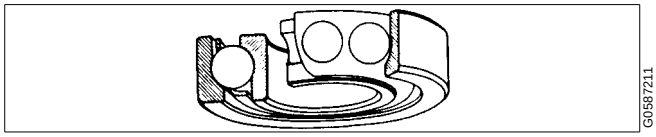
  - Make sure the bearing is assembled at a right angle to the shaft (spindle).

- If necessary use a driving-on sleeve that abuts the ring which is to be assembled with an interference fit, otherwise there is a risk that the rolling elements and raceways may be damaged and premature failure may follow.



Angular contact ball bearings

Always fit single-row angular contact ball bearings with the wide shoulder of the inner race facing the axial load (upwards on a bowl spindle).



5.11.2 Before shutdowns

Before the separator is shut-down for a period of time, the following must be carried out:

- Remove the bowl, according to instructions in Chapter 6.

NOTE

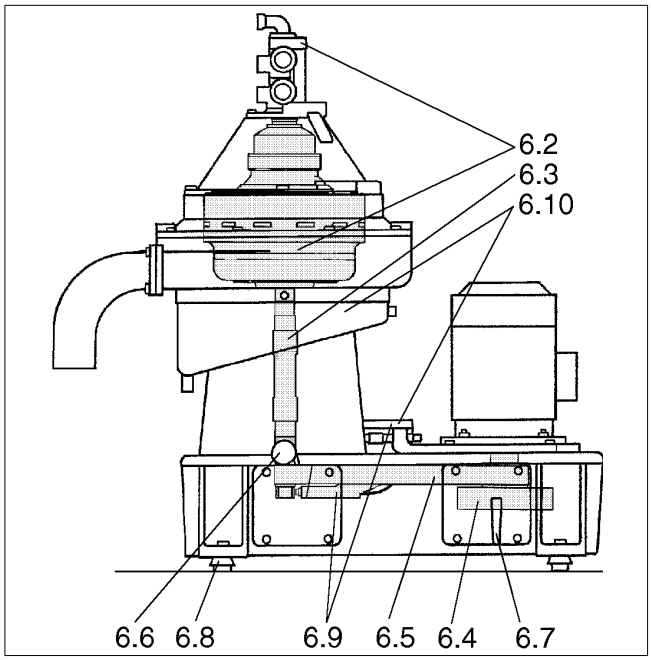
The bowl must not be left on the spindle during standstill for more than one week.

Vibration in foundations can be transmitted to the bowl and produce one-sided loading of the bearings. The resultant indentations in the ball bearing races can cause premature bearing failure.

- Protect cleaned carbon steel parts against corrosion by oiling. Separator parts that are not assembled after cleaning must be wiped and protected against dust and dirt.
- If the separator has been shut-down for more than 3 months but less than 12 months, an Intermediate Service (IS) has to be made. If the shut-down period has been longer than 12 months, a Major Service (MS) should be carried out.

6 Dismantling/Assembly

Contents

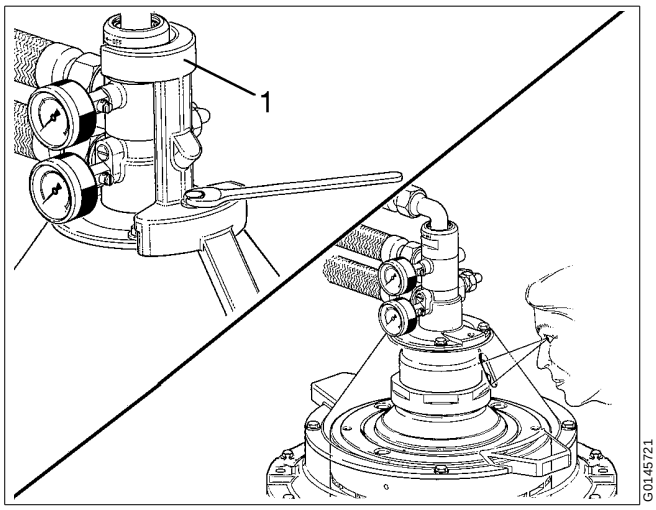


6.1 Introduction

6.1.1 General directions

The separator must be dismantled regularly for cleaning and inspection.

The recommended intervals are stated in chapter “5.1.2 Maintenance intervals” on page 41.



DANGER

Entrapment hazards

Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

Remove safety device (1) and look through the slot in the frame hood to see if the bowl still rotates.

To avoid accidental start, switch off and lock power supply before starting any dismantling work.

The frame hood and heavy bowl parts must be lifted by hoist. Position the hoist directly above the bowl centre. Use an endless sling and a lifting hook with catch.

These parts must be handled carefully.

Do not place parts directly on the floor, but on a clean rubber mat, fibreboard or a suitable pallet.

6.1.2 References to check-points

In the text you will find references to the Check Point instructions in Chapter 5. The references appear in the text as in the following example:

✔ **Check point**
“5.6.7 Disc stack pressure” on page 58.

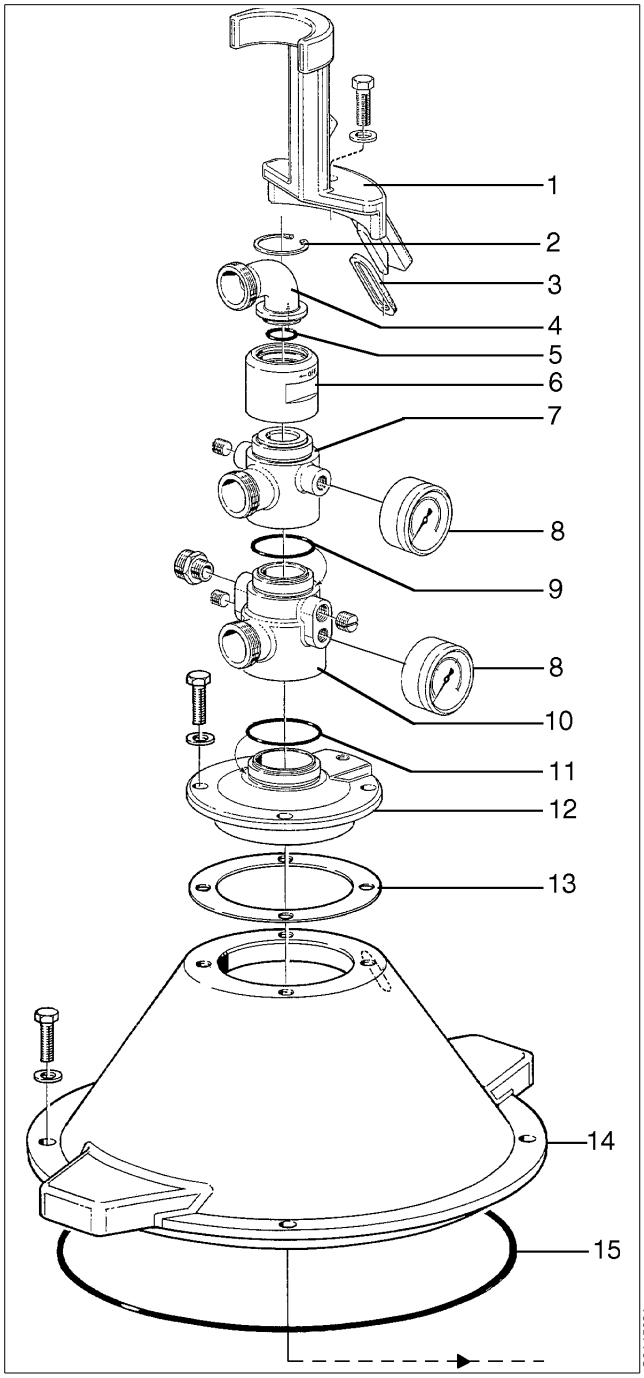
In this example, look up check point Disc stack pressure in Chapter 5 for further instructions.

6.1.3 Tools

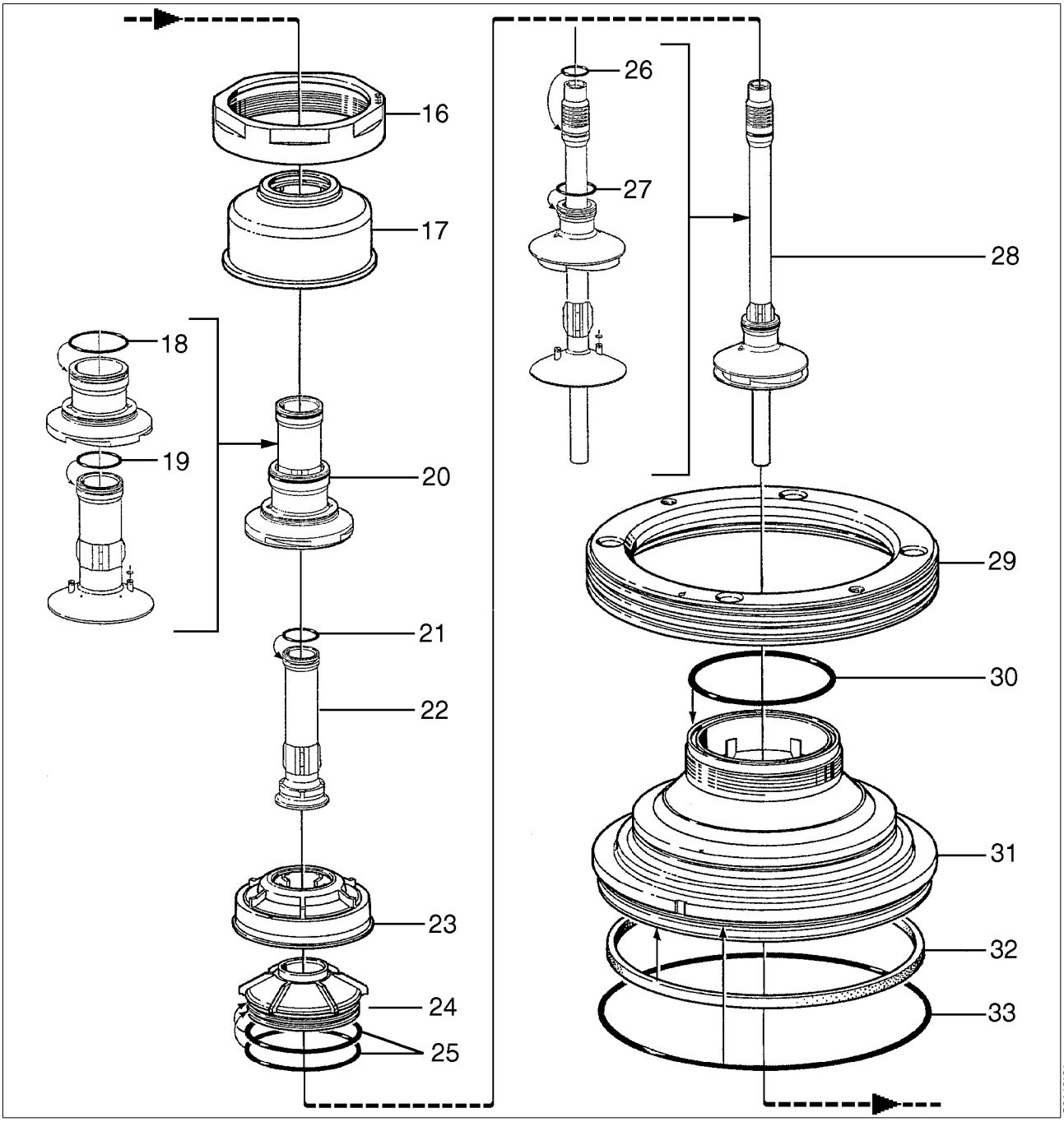
Special tools from the tool kit must be used for dismantling and assembly. The special tools are specified in the *Spare Parts Catalogue* and are shown as illustrations together with the instructions on the following pages.

6.2 Inlet/outlet, frame hood and bowl

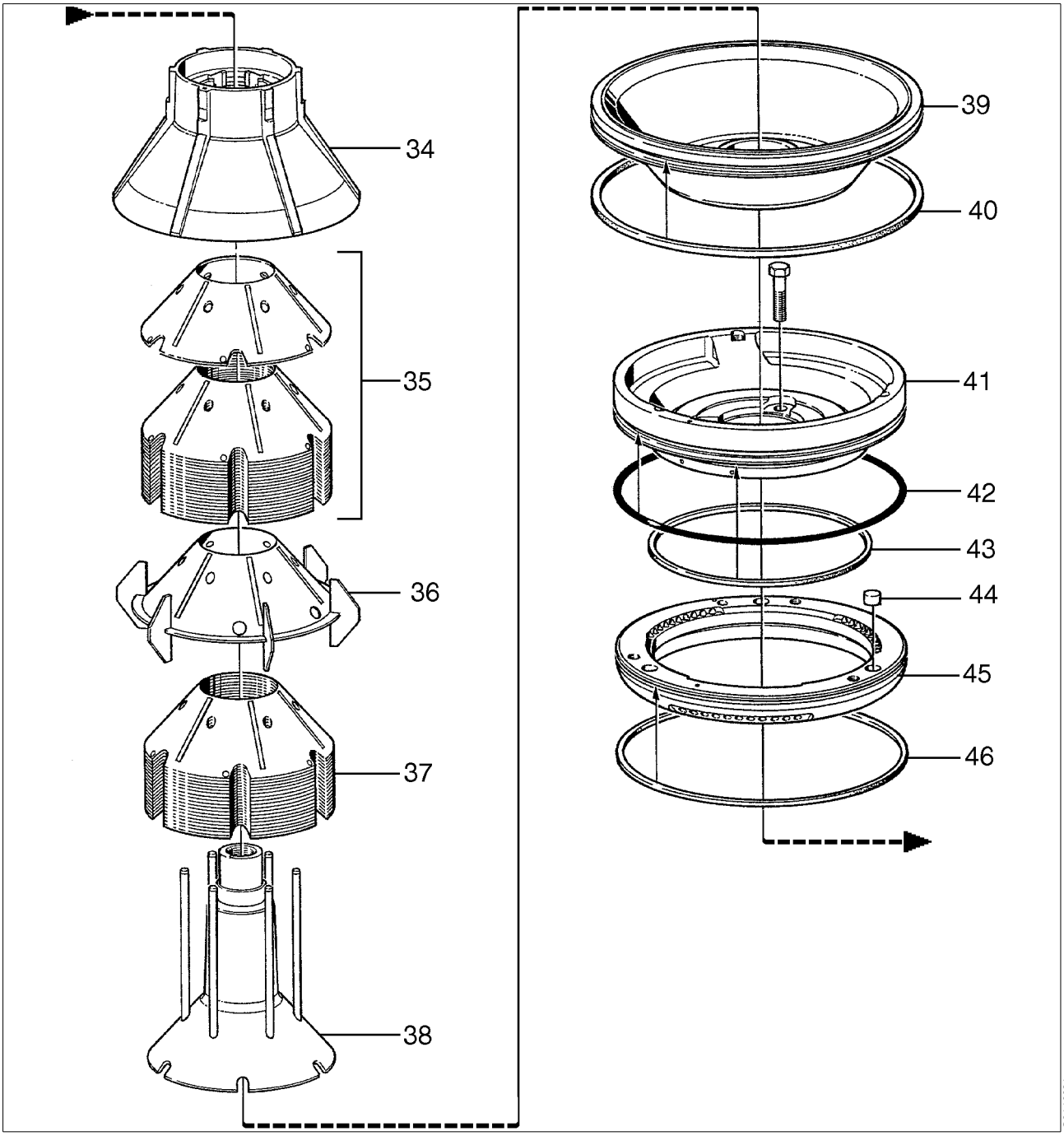
6.2.1 Exploded view



1. *Safety device*
2. *Snap ring*
3. *Gasket*
4. *Inlet bend*
5. *O-ring*
6. *Nut*
7. *Inlet and outlet housing*
8. *Pressure gauge*
9. *O-ring*
10. *Outlet housing*
11. *O-ring*
12. *Connecting housing*
13. *Height adjusting ring*
14. *Frame hood*
15. *O-ring*

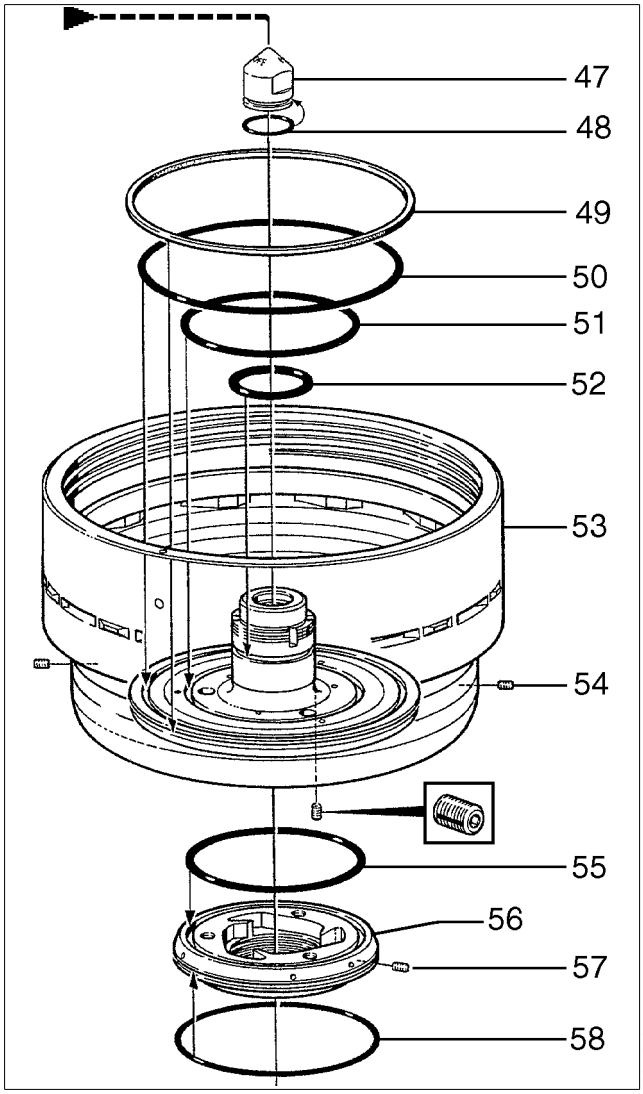


16. *Small lock ring*
17. *Paring chamber*
18. *O-ring*
19. *O-ring*
20. *Paring disc*
21. *O-ring*
22. *Recirculation pipe*
23. *Flow control disc*
24. *Paring chamber cover*
25. *O-ring*
26. *O-ring*
27. *O-ring*
28. *Inlet pipe with oil paring disc*
29. *Large lock ring*
30. *O-ring*
31. *Bowl hood*
32. *Seal ring*
33. *O-ring*

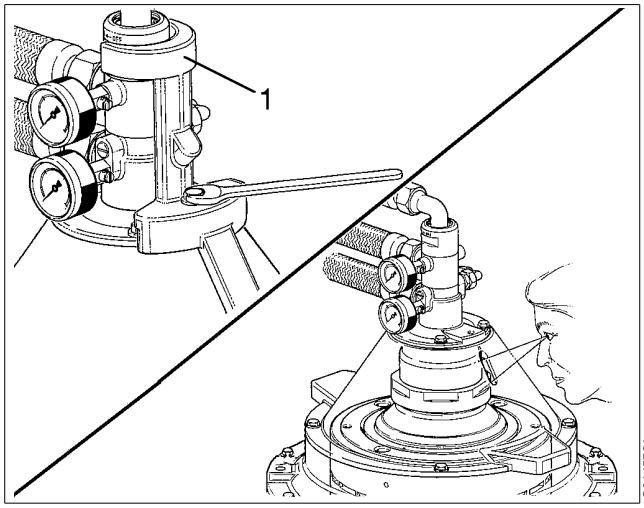


34. Top disc
35. Bowl discs
36. Wing insert
37. Bowl discs
38. Distributor
39. Sliding bowl bottom
40. Rectangular ring
41. Distributing ring
42. O-ring
43. Rectangular ring
44. Valve plug
45. Operating slide
46. Rectangular ring

47. *Cap nut*
48. *O-ring*
49. *Rectangular ring*
50. *O-ring*
51. *O-ring*
52. *O-ring*
53. *Bowl body*
54. *Nozzle*
55. *O-ring*
56. *Operating water ring*
57. *Nozzle*
58. *O-ring*



6.2.2 Dismantling



DANGER

Entrapment hazards

Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

Remove safety device (1) and look through the slot in the frame hood to see if the bowl still rotates.

To avoid accidental start, switch off and lock power supply before starting any dismantling work.

The frame hood and the heavy bowl parts must be lifted by means of a hoist. Position the hoist exactly above the bowl centre. Use an endless sling and a lifting hook with catch.

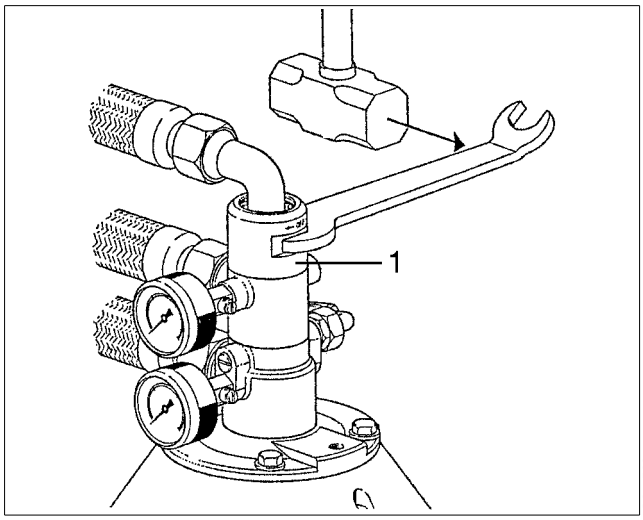
The parts must be handled carefully. Don’t place parts directly on the floor, but on a clean rubber mat, fibreboard or a suitable pallet.

CAUTION

Burn hazards

The separator parts may be hot for some time after the separator has stopped.

1. Loosen and remove the connecting hoses.



WARNING

Burn hazards

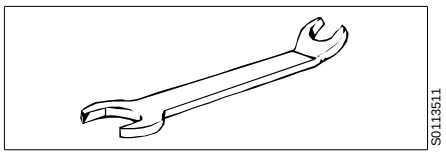
When loosen the connecting hoses hot liquid may run out.

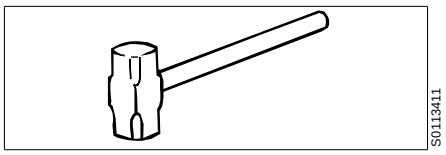
2. Unscrew nut (1).

   Left-hand thread!

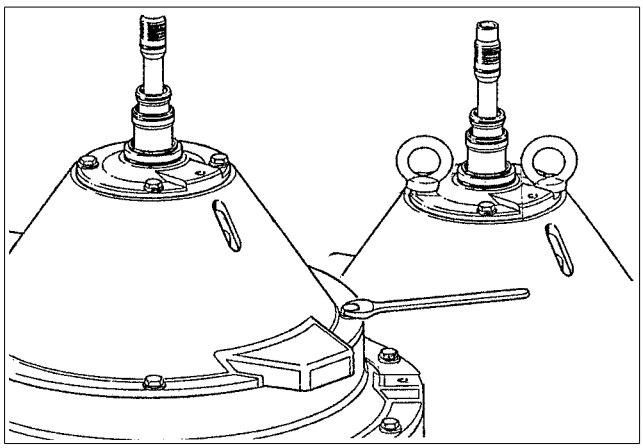
   a. Remove inlet and outlet housing and outlet housing, together with connecting hoses.

   b. In the case of complete dismantling, remove the snap ring that secures inlet bend and lift out the bend.



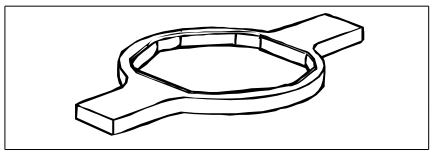


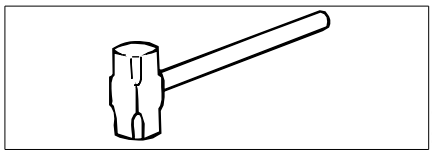
3. Lift off frame hood. Two lifting eye bolts (M12) (not included in the tool kit) can be screwed into the holes in the hood thus making it possible to lift the hood by means of a hoist.

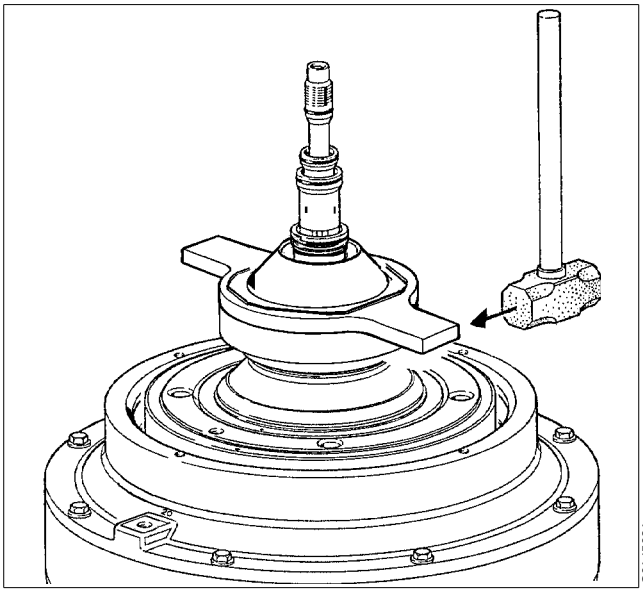


4. Unscrew small lock ring using the spanner for lock ring. Remove paring chamber.

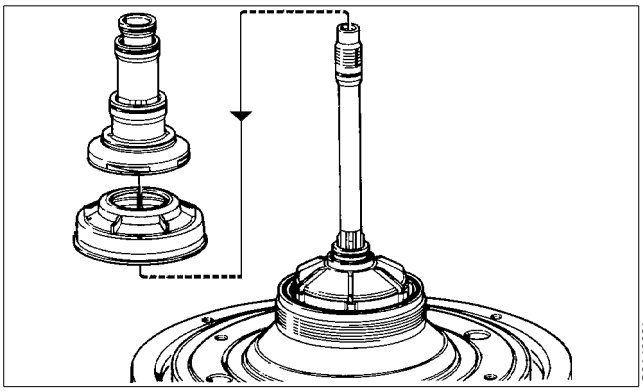
   Left-hand thread!



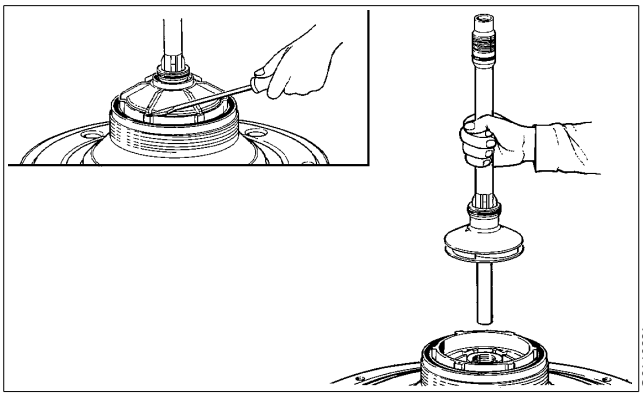




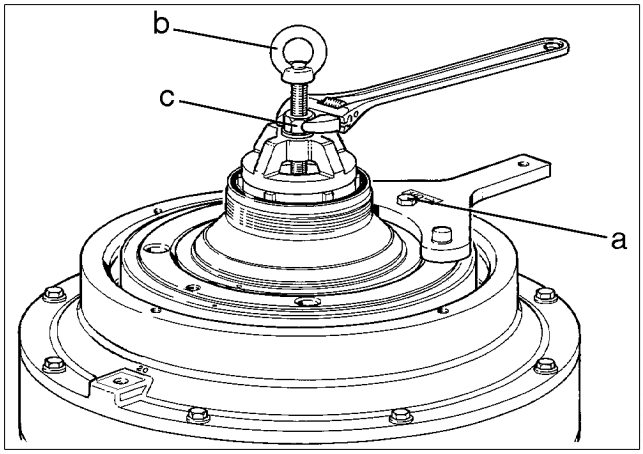
5. Lift off the unit consisting of upper paring disc and recirculation pipe. Remove flow control disc.



6. Carefully prise loose paring chamber cover by means of a screw driver. Remove the cover. Lift out the inlet pipe with oil paring disc.



7. Apply the brake. Unscrew the large lock ring as described below.



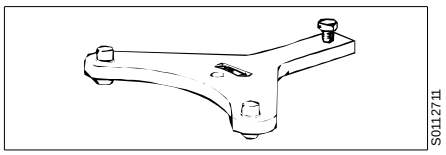
NOTE

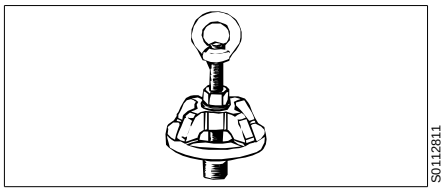
- Use of substitute tools can damage the equipment.
- Use only the compression tool as instructed.

a. Fit the spanner to the large lock ring and secure it with the bolt (a).

b. Fit the compression tool and screw the central screw (b) down into the distributor until it stops.

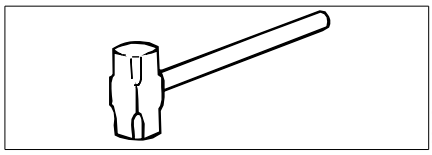
c. Compress the disc stack by tightening the nut (c) very firmly.

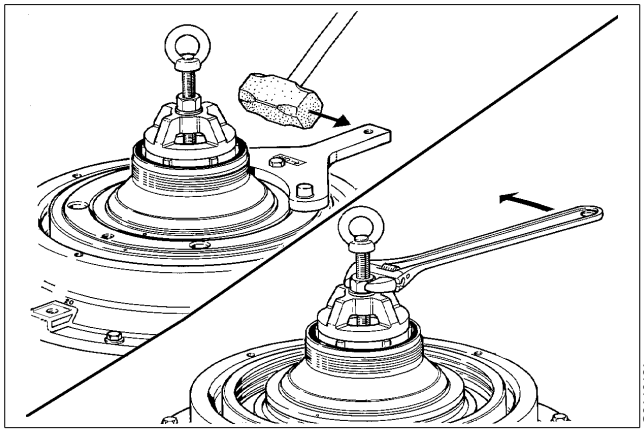




8. Unscrew the large lock ring by striking the spanner with a tin hammer.

   Left-hand thread!



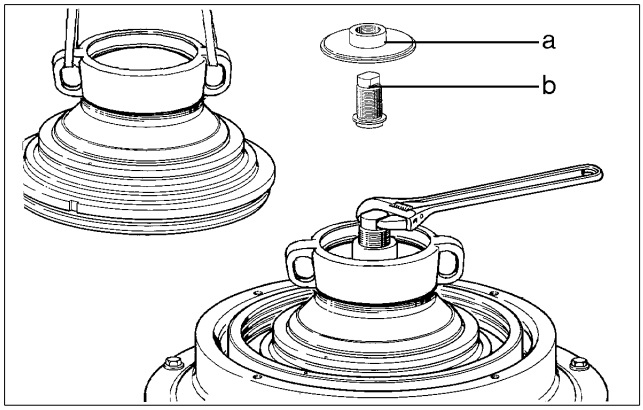


> **CAUTION**
>
> **Cut hazards**
>
> Sharp edges on the large lock ring may cause cuts.

9. Unscrew the nut of the compression tool sufficiently to decompress the disc stack.

10. Lift out bowl hood by using the lifting tool for the small lock ring.

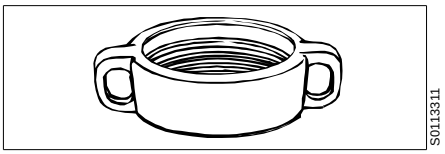
    - If the bowl hood sticks in the bowl body, remove the compression tool and fit the nut (a), screw (b) and the lifting tool. Together with an adjustable wrench the bowl hood can now be forced out.

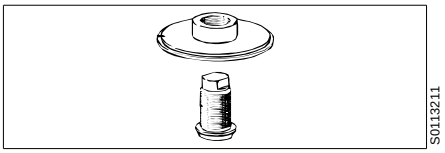


CAUTION

Crush hazard

If the top disc is stuck into the bowl hood, remove it now before it accidentally falls out.

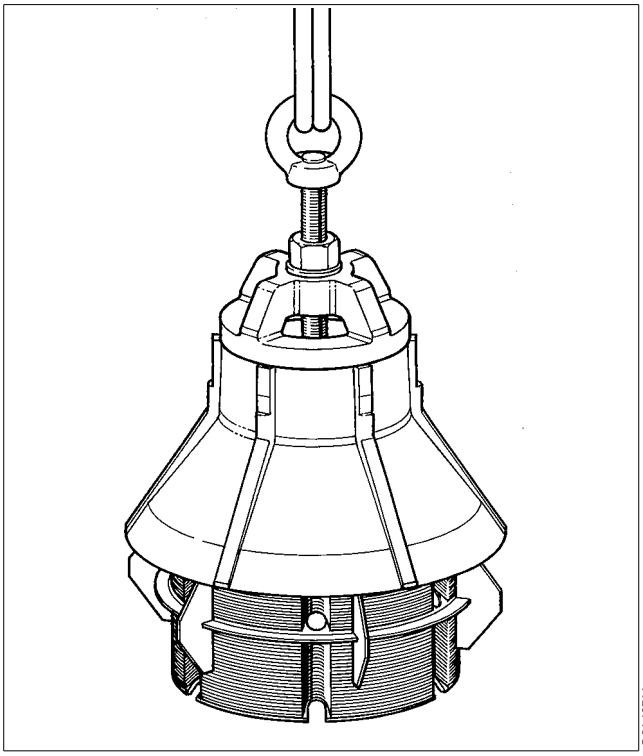




11. Lift out distributor with bowl discs, wing insert and the top disc. Use the compression tool.

    a. After removal, loosen the nut of the compression tool and turn the unit, with the tool still attached, upside down and strike the central screw of the tool against a firm base. This will facilitate loosening of the top disc.

    b. Remove the tool.



CAUTION

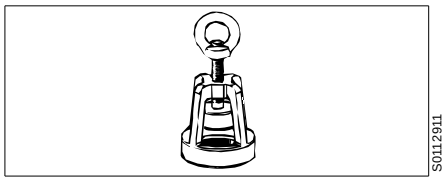
Cut hazards

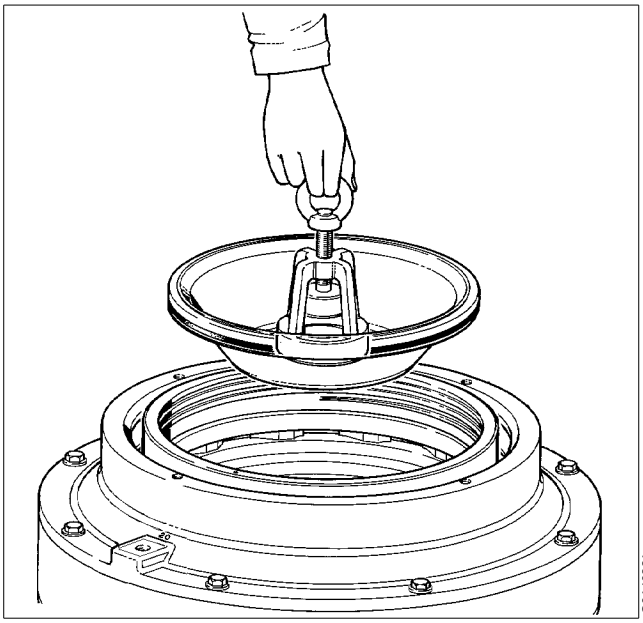
Sharp edges on the bowl discs may cause cuts.

12. Remove deposits and clean all parts thoroughly in a suitable cleaning agent. See chapter “5.2 Maintenance Logs” on page 40 and “5.6 Cleaning” on page 74.

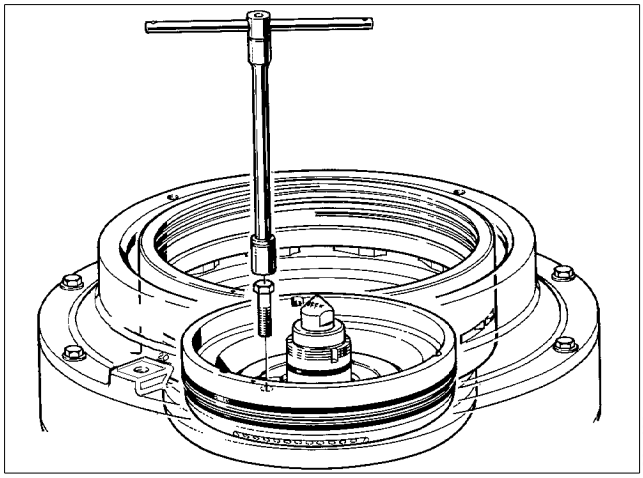
13. Fit the lifting tool onto the sliding bowl bottom and lift it out.

    - Ease off the sliding bowl bottom by using the central screw of the tool.





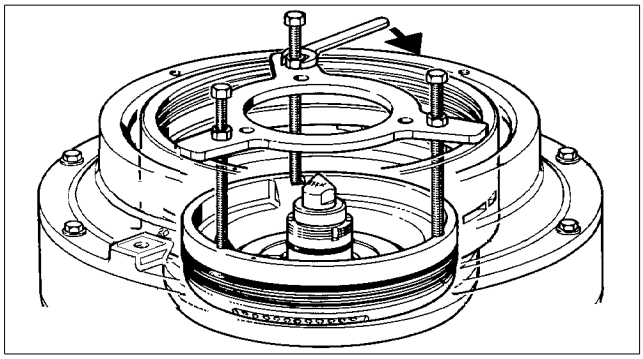
14. Unscrew the three screws in the bottom of the bowl body.

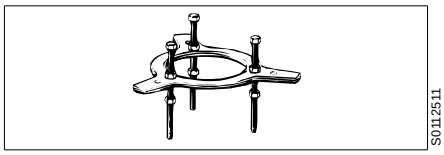


15. Fit the dismounting tool on bowl body. Fasten the screws of the tool in distributing ring. Loosen the distributing ring by tightening the nuts one turn at a time.

    Lift out the distributing ring.

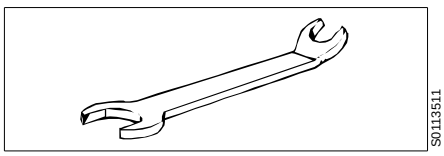
16. Remove operating slide in the same way as the distributing ring.

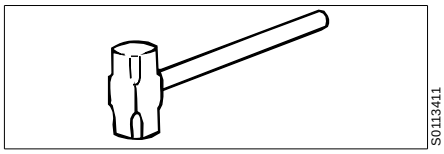


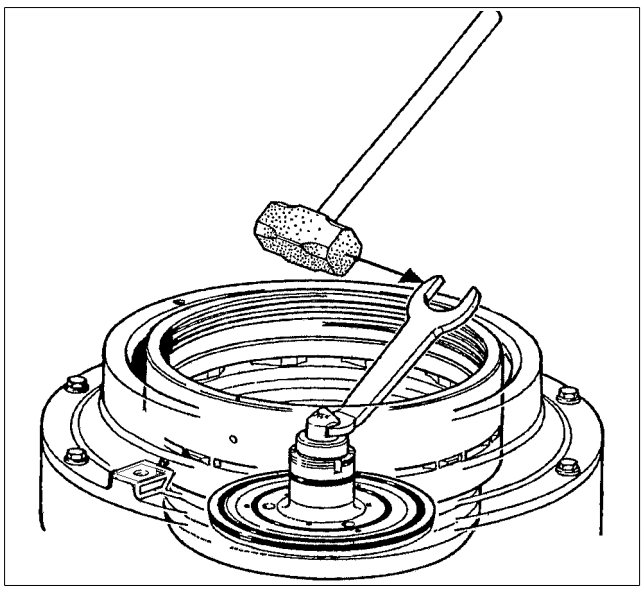


17. Unscrew cap nut.

    Left-hand thread!







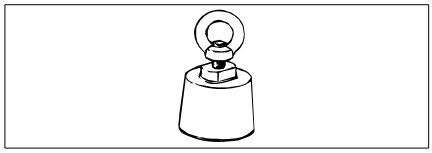
18. Remove the bowl body as follows:

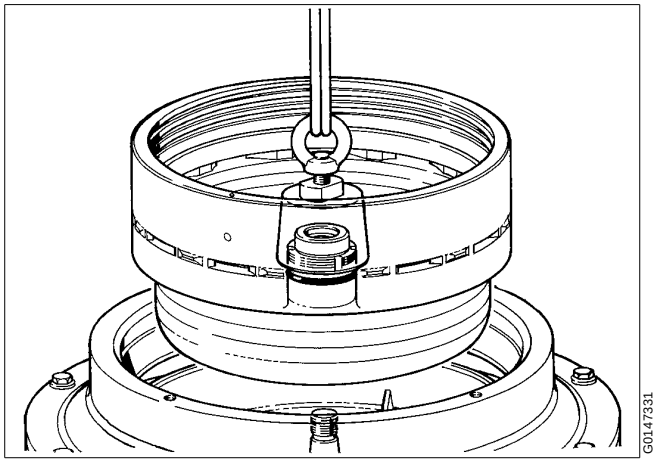
    a. Unscrew the central screw of the lifting tool as far as possible.

    b. Screw the tool onto the bowl body nave.

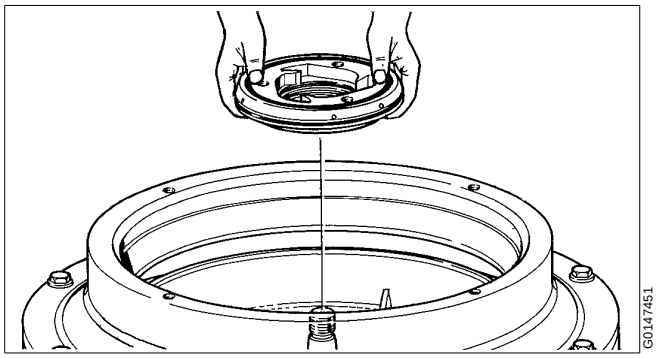
    c. Ease off the bowl body by screwing down the central screw.

    d. Lift off the bowl body using hoist.





19. Lift out operating water ring, which may have fallen down on the distributing cover in the frame. If not, the ring may still be in its place on the underside of the bowl body.



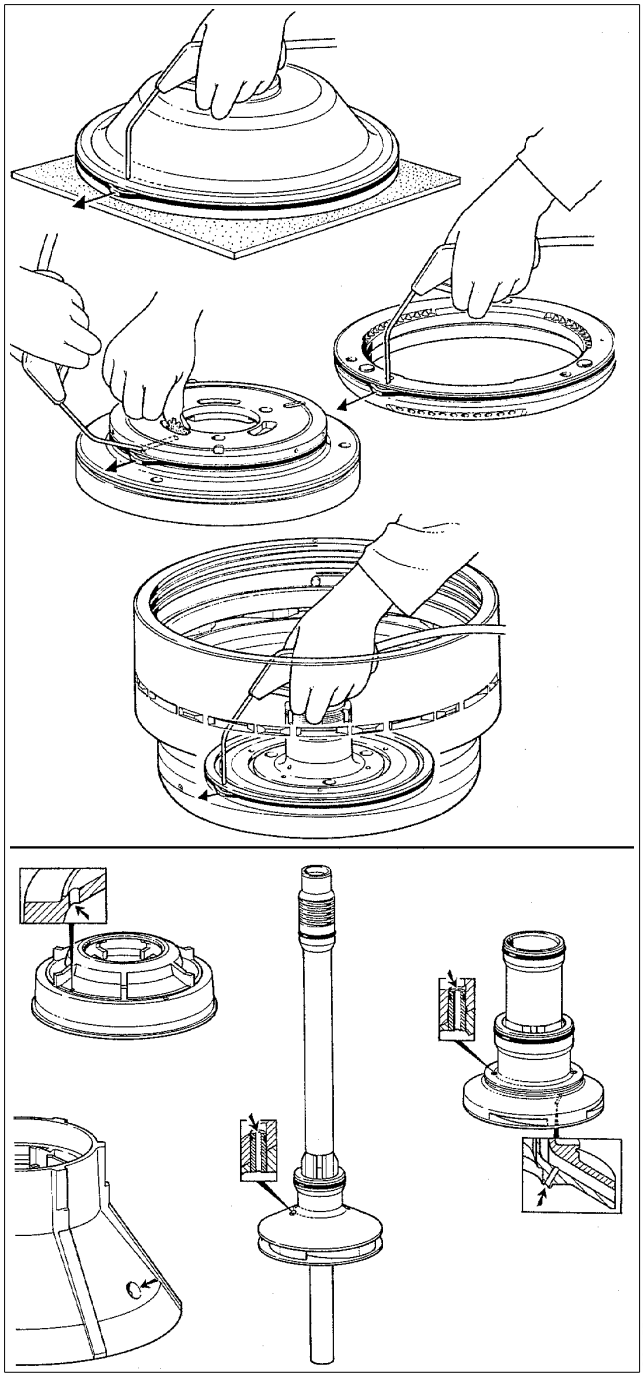
20. Remove any thick deposits in the frame hood and clean all other parts thoroughly in a suitable cleaning agent. See ‘‘5.2 Maintenance Logs” on page 44 and “5.6 Cleaning” on page 79.

21. Remove seal rings from sliding bowl bottom, distributing ring, operating slide and bowl body using compressed air.

    Note! Only one of the six radial holes in the distributing ring connect to a hole that admits compressed air.

22. Remove any clogging in the small holes in:

    - upper paring disc (4 + 2 holes)
    - inlet pipe with oil paring disc (2 holes)
    - flow control disc (1 hole)
    - top disc (1 hole)

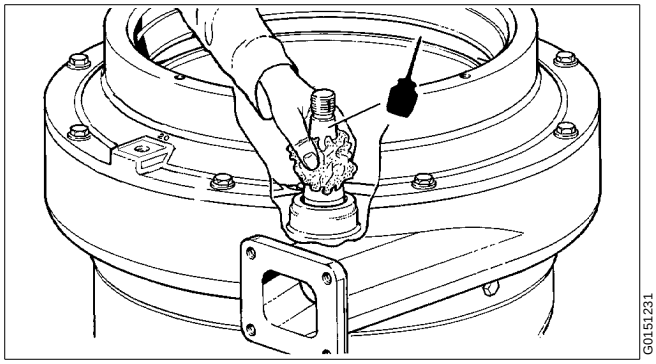


6.2.3 Assembly

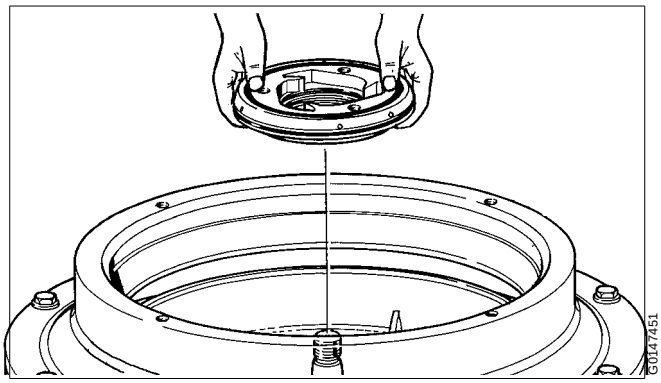
✔ **Check points**

“5.3.2 Bowl spindle cone and bowl body nave” on page 50,
“5.3.3 Corrosion” on page 51,
“5.3.4 Cracks” on page 53,
“5.3.6 Erosion” on page 55,
“5.3.7 Guide surfaces” on page 57,
“5.3.8 Lock ring; wear and damage” on page 60,
“5.3.9 Nozzles in bowl body and operating water ring” on page 62,
“5.3.10 Inlet pipe” on page 62,
“5.3.11 Operating mechanism” on page 63,
“5.3.12 Operating slide” on page 64,
“5.3.13 Sliding bowl bottom” on page 64,
“5.4.8 Guide surfaces” on page 71 (only MS).

1. Wipe clean spindle top and nave bore in bowl body. Apply oil to the tapered end of the spindle, smear it over the surface and wipe off surplus with a clean cloth.

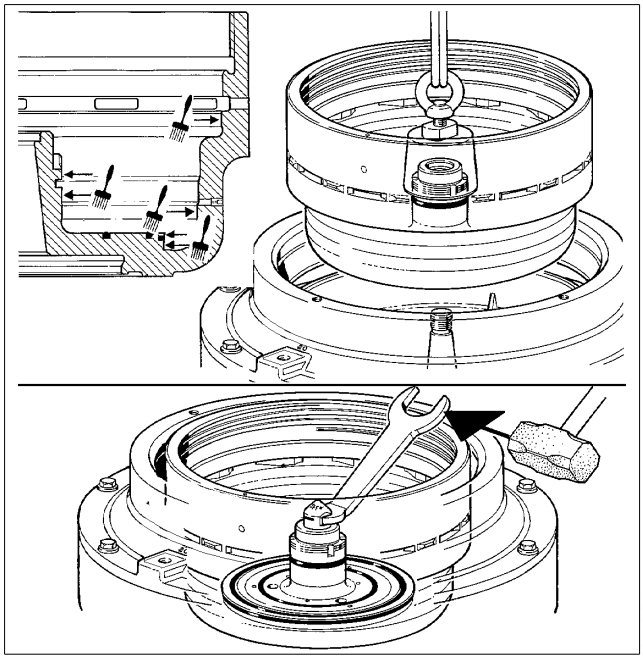


2. Fit operating water ring on the distributing cover in the frame.



3. Lubricate the guide surfaces of the bowl body. See chapter ‘‘8.5 Lubricants” on page 188.
4. Fit the bowl body onto the spindle as follows:
   a. Screw down the central screw as far as possible.
   b. Screw the tool onto bowl body nave.
   c. Lower the bowl body until the screw rests on the spindle top. Use a hoist.
   d. Unscrew the central screw so that the bowl body sinks down on the spindle.
5. Screw cap nut counter-clockwise onto the spindle. Tighten firmly.

   Left-hand thread!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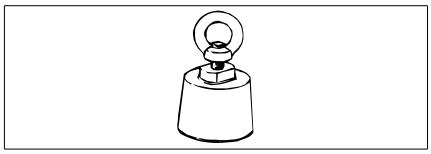
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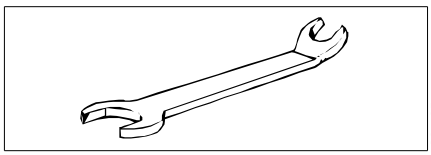
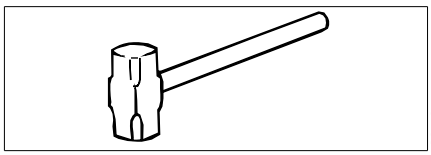
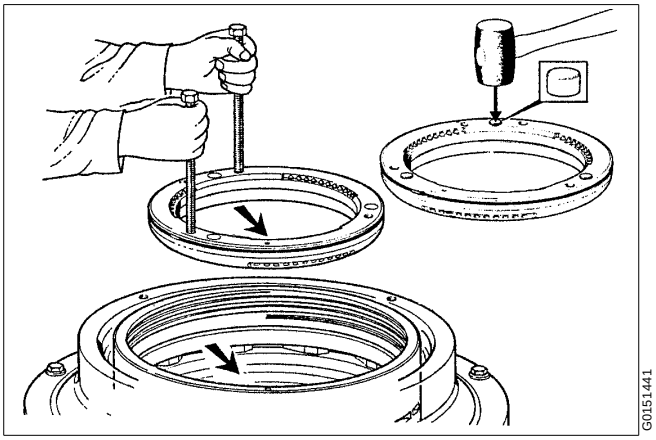
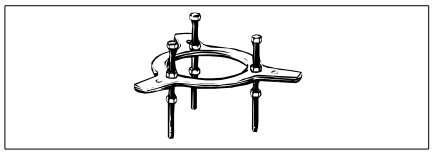

S0113511

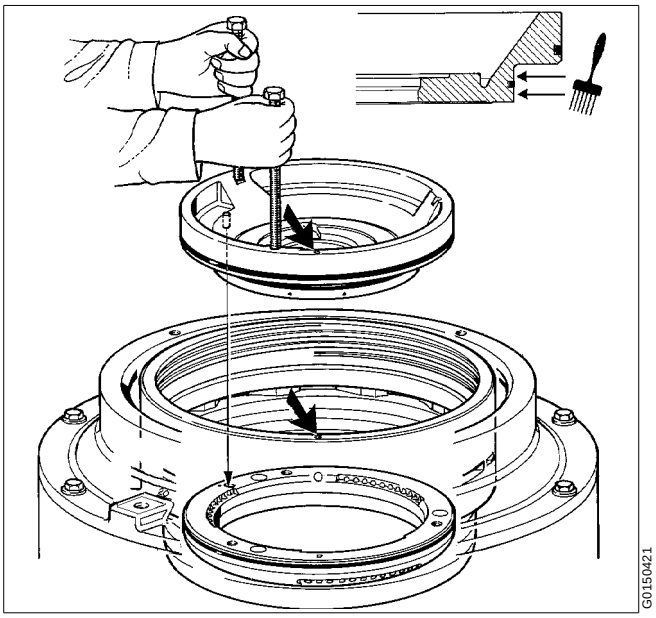

S0113411

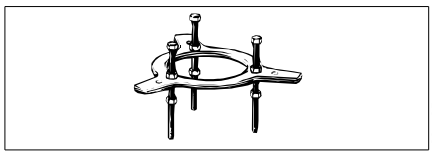
6. Fit operating slide into the bowl body by using two of the dismounting tool screws.
   - The drill mark (arrow) on the operating slide must be in line with the assembly mark of the bowl body.
   - Check that the seal ring lies concentric in its groove.
   - When replacing valve plugs, use a rubber mallet.





7. Lubricate the guide surface of the distributing ring. See chapter “8.5 Lubricants” on page 188.
8. Fit distributing ring by using two of the dismounting tool screws.
   - Check that the seal rings lie concentrically in their grooves.
   - Rotate the distributing ring so that its drill mark (arrow) is in line with the assembly mark on the bowl body. When lowering the ring, its guide pin will then enter the hole in the operating slide.

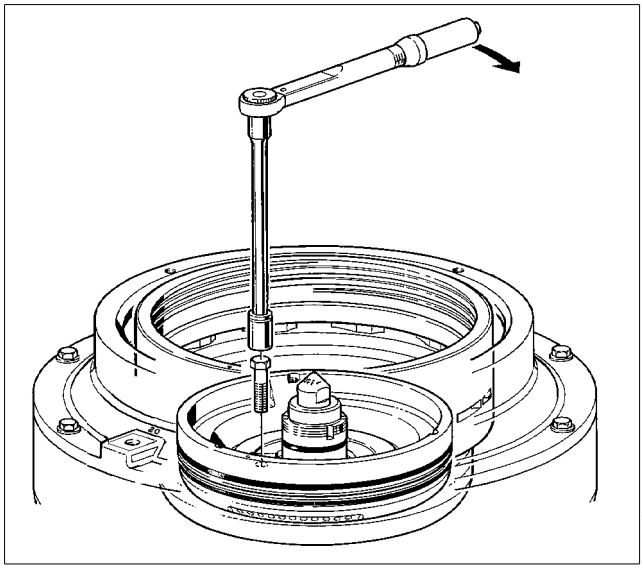




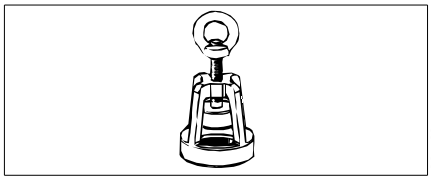
9. Rotate the bowl body slowly to align the three screw holes in its bottom exactly above the holes in the operating water ring (only one position is possible). Tighten the screws.

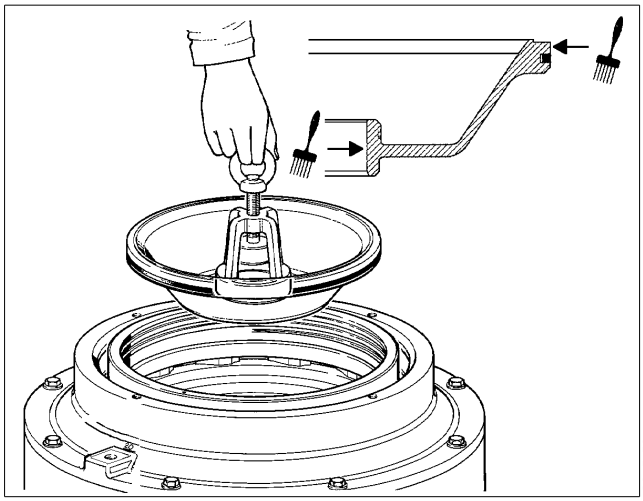
   Tightening torque: 50 Nm, ± 5Nm.

10. Lubricate the guide surface of the sliding bowl bottom. See chapter ‘‘8.5 Lubricants” on page 188.

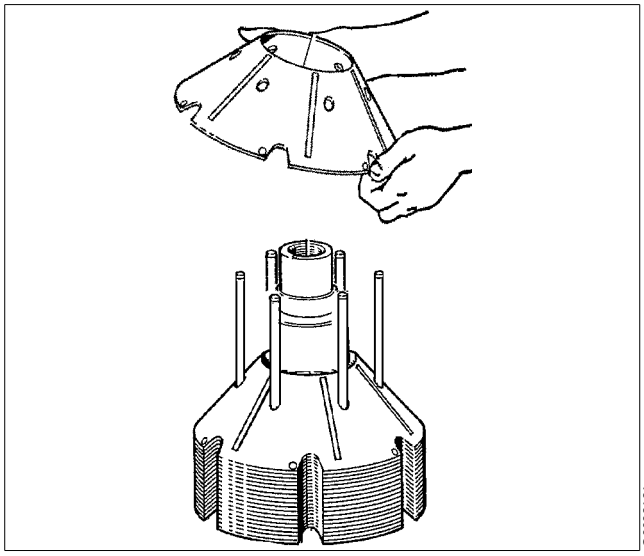


11. Fit sliding bowl bottom. Check that its seal ring lies concentrically in its groove.





12. Assemble the discs one by one on the distributor.



CAUTION

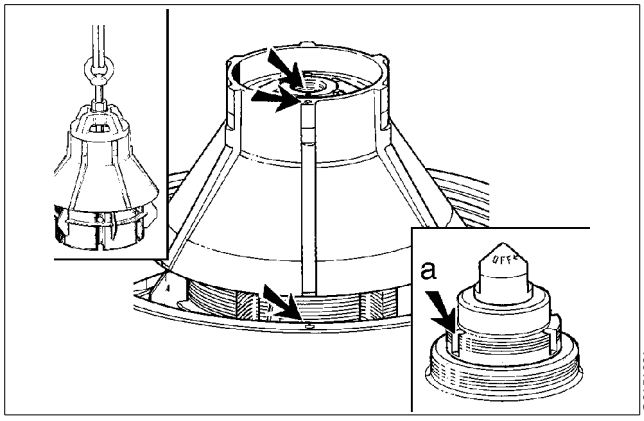
Cut hazards

Sharp edges on the bowl discs may cause cuts.

For correct number of bowl discs above and below the wing insert when the machine was new, see the *Spare Parts Catalogue*.

The number of bowl discs above the wing insert may be increased to adjust the disc stack pressure.

13. Fit the compression tool and lower the unit into the bowl body.

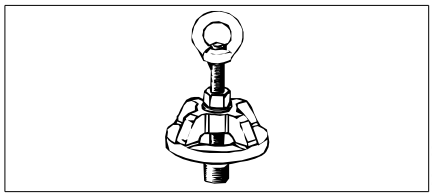


a. Make sure that the drill mark (arrow) of the top disc is in line with the drill mark on the distributor.

b. When lowering the unit, make sure that the drill marks are in line with the assembly mark on the bowl bottom. The two drill marks and the assembly mark must be properly aligned to enable the wings in the underside of the distributor to enter recesses (a) of the bowl body nave.

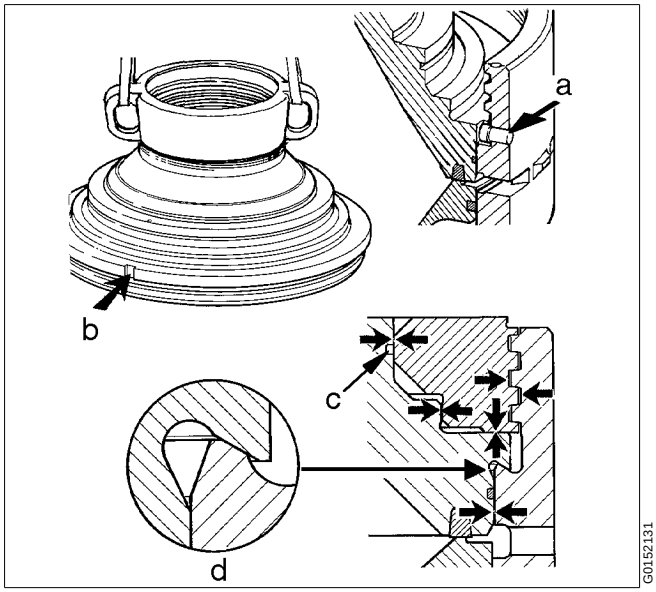
c. Make sure that the pins in the distributor fit properly into the holes of the top disc.

d. Remove the compression tool.



14. Lubricate the large lock ring threads, contact and guiding surfaces (see arrows in lower illustration). See also chapter “8.5 Lubricants” on page 188.

    - Note that no O-ring should be present in grove (c).
    - Make sure that the surfaces of the dovetail slot (d) are undamaged and thoroughly cleaned. These surfaces **must not** be lubricated.

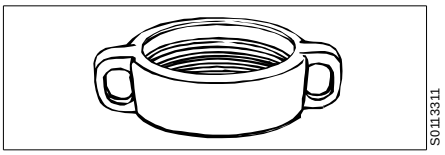


✔ **Check point**
“5.4.10 Lock ring; priming” on page 73 (only MS).

15. Fit the lifting tool to the bowl hood and lift it using hoist. Be careful not to scratch the bowl hood seal ring when lowering the bowl hood onto the bowl body.

    - The guide lug (a) on the bowl body must enter the recess (b) in the bowl hood.
    - Remove the lifting tool.

✔ **Check point**
“5.3.1 Bowl hood seal ring” on page 49.

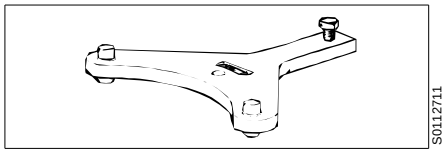


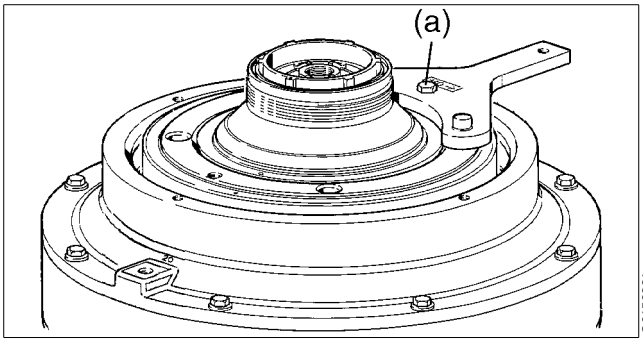
16. Fit the large lock ring and tighten it by hand as far as possible.

> **CAUTION**
>
> **Cut hazards**
>
> Sharp edges on the large lock ring may cause cuts.

✔ **Check point**
See chapter “5.3.5 Disc stack pressure” on page 54.

17. Fit the spanner and secure it with the bolt (a).





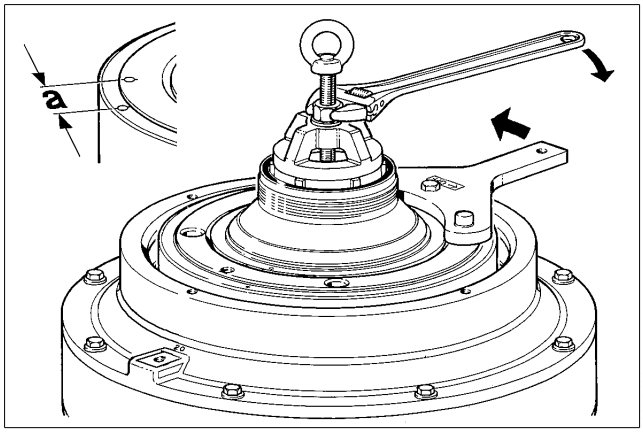
> **NOTE**
>
> To facilitate tightening of the lock ring, reduce shocks to bearings and keep the thread wear to a minimum, the disc stack should be compressed using the compression tool.

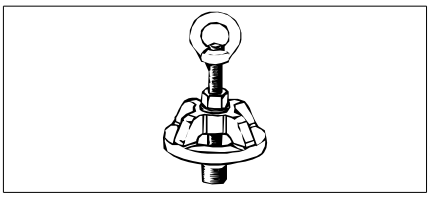
18. Compress the disc stack as follows:

    a. Fit the compression tool and screw the central screw down into the distributor until it stops.

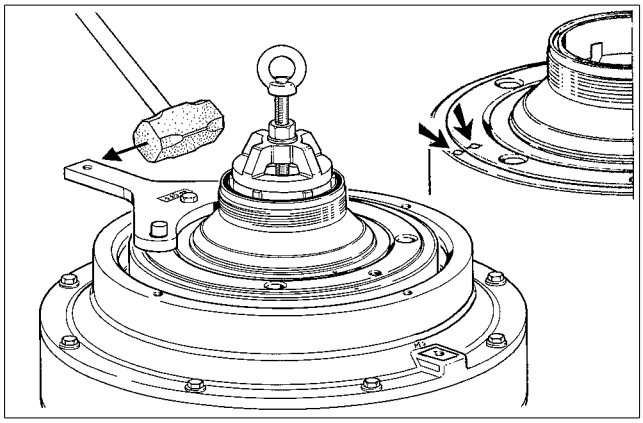
    b. Compress the disc stack by tightening the nut of the compression tool very firmly.

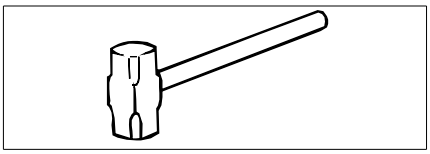
    c. When the pressure of the disc stack is relieved, it is normally possible to tighten the large lock ring by hand until its assembly mark is positioned slightly ahead, (about 5 mm) of the corresponding mark on the bowl body (distance “a” in the illustration).





19. Tighten the large lock ring until the assembly marks are in line.





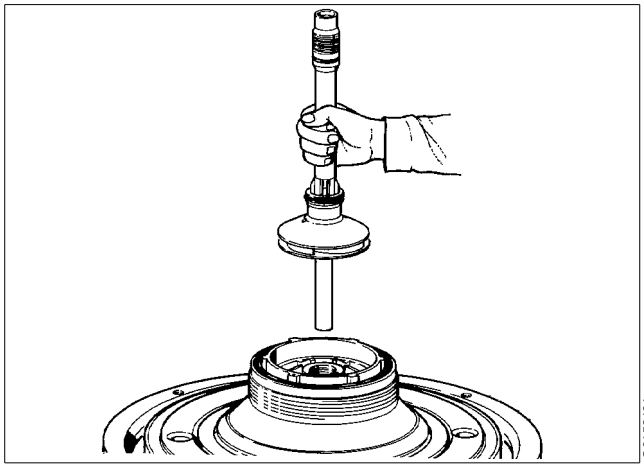
NOTE

The assembly marks must never pass each other more than 25°.

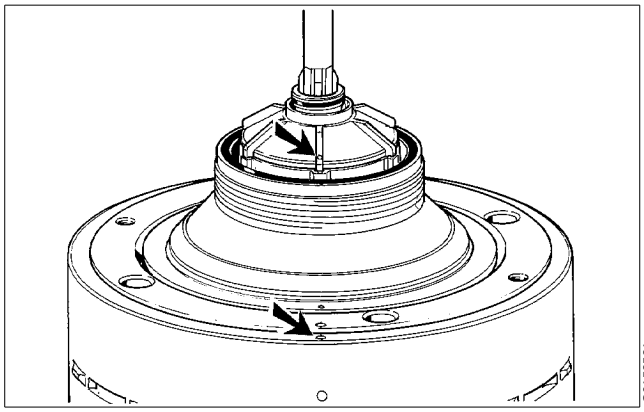
See chapter ‘‘5.3.8 Lock ring; wear and damage” on page 60 for more information.

20. Remove the compression tool and spanner.

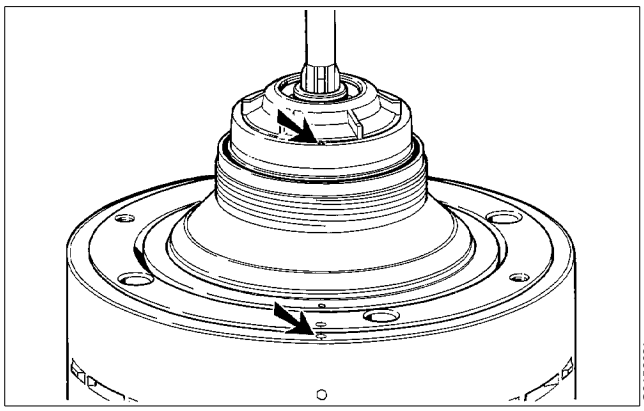
21. Place inlet pipe with oil paring disc in the bowl.



22. Fit paring chamber cover. The drill mark on the cover must be in line with the assembly mark on the bowl body.

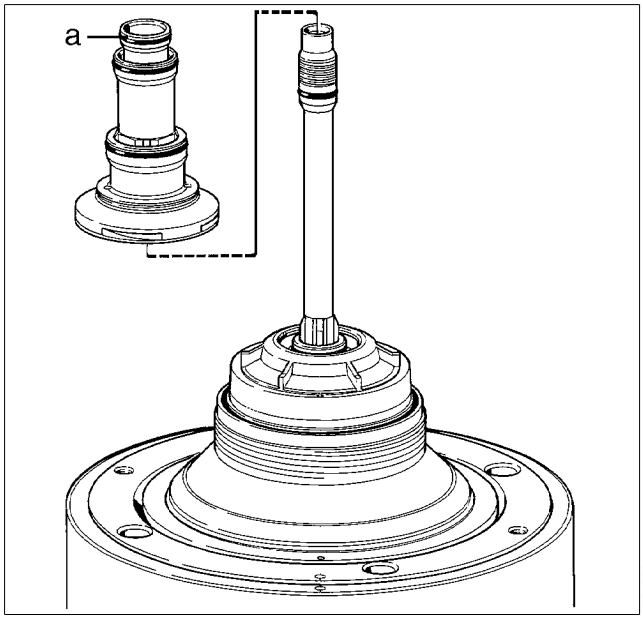


23. Fit flow control disc. The drill mark on the disc must be in line with the assembly mark on the bowl body.

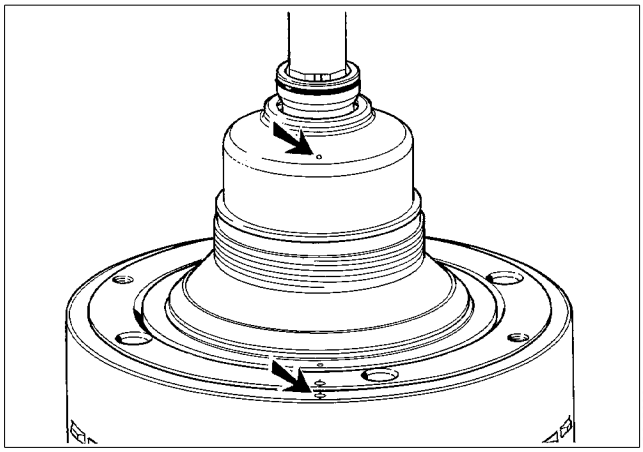


24. Place recirculation pipe and upper paring disc together to form a unit. Place the unit in the bowl.

    - To facilitate assembling fit the upper O-ring (a) onto the recirculation pipe **after** the unit is assembled.



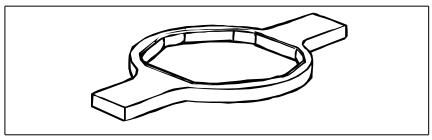
25. Fit paring chamber. The drill mark on the chamber must be in line with the assembly mark of the bowl body.

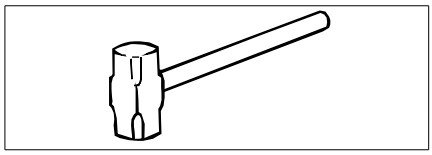


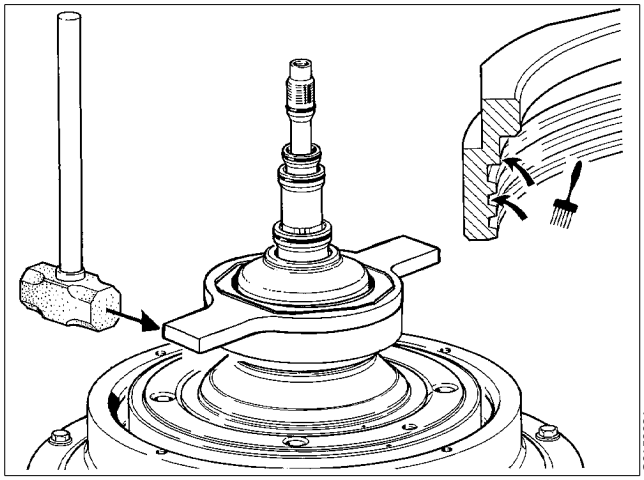
26. Lubricate the threads and the guiding surfaces on the lock ring. See chapter ‘‘8.5 Lubricants” on page 188.

27. Fit and tighten the lock ring using the spanner for lock ring.

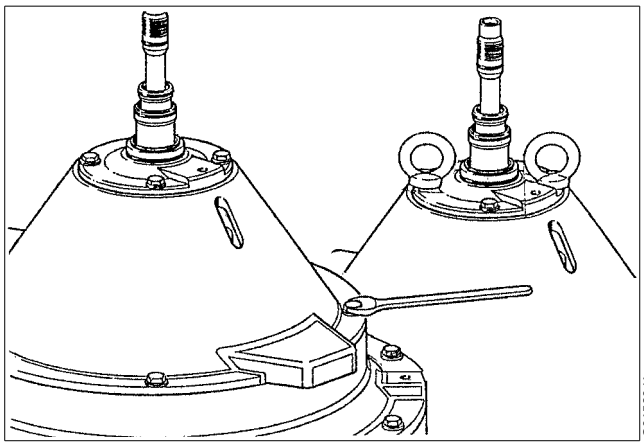
    Left-hand thread!







28. Fit frame hood. Two lifting eye bolts (M12) (not included in the tool kit) can be screwed into the holes in the hood thus making it possible to lift the hood by means of a hoist.

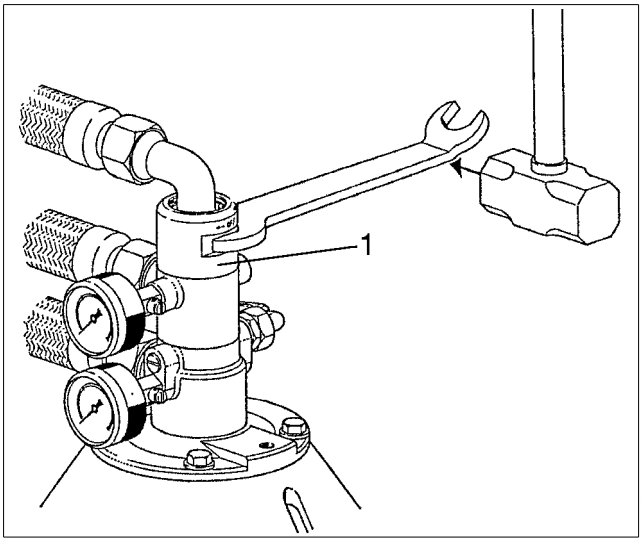


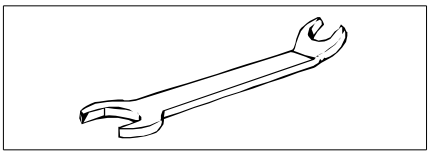
29. Lubricate the threads and guiding surfaces of the nut, outlet housing and inlet/outlet housing. See chapter “8.5 Lubricants” on page 188.

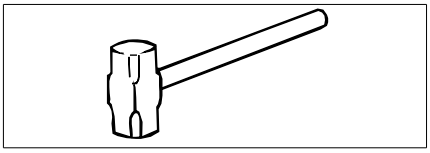
30. Fit outlet housing and inlet/outlet housing.

    Tighten nut (1).

    Left-hand thread!



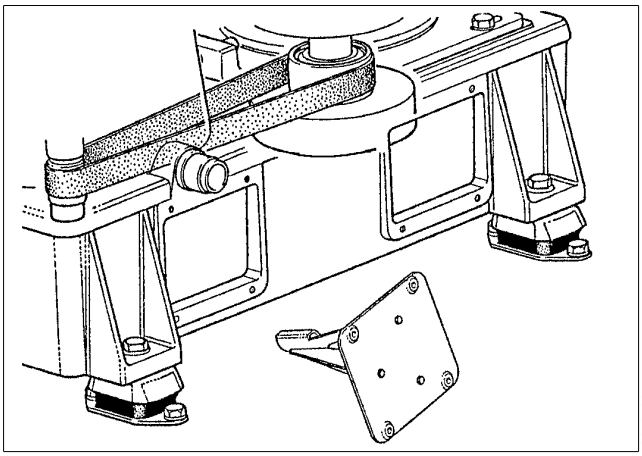




31. Remove the two covers on the frame bottom part.

32. Rotate the bowl by means of the flat belt or the friction coupling.If the bowl does not rotate freely or if a scraping noise is heard, incorrect bowl assembly or incorrect height adjustment of the oil paring disc may be the cause.

✔ **Check point**
“5.4.9 Height position of oil paring disc” on page 72.



CAUTION

Crush hazards

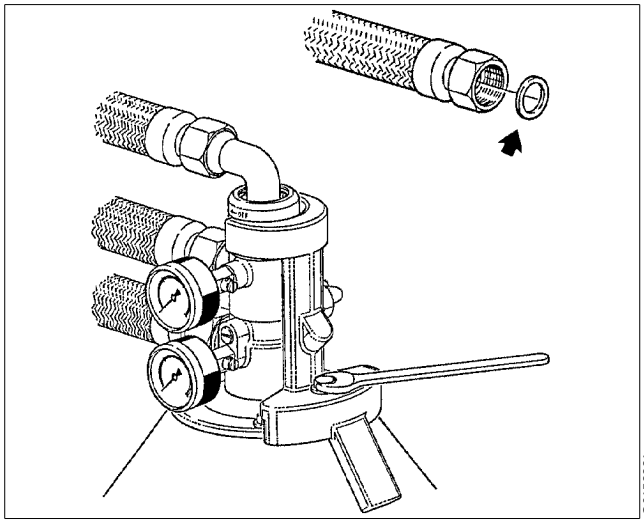
Rotating the bowl by pulling the flat belt by hand may cause injuries to fingers.

33. Fit the two covers on the frame bottom part.

34. Fit safety device.

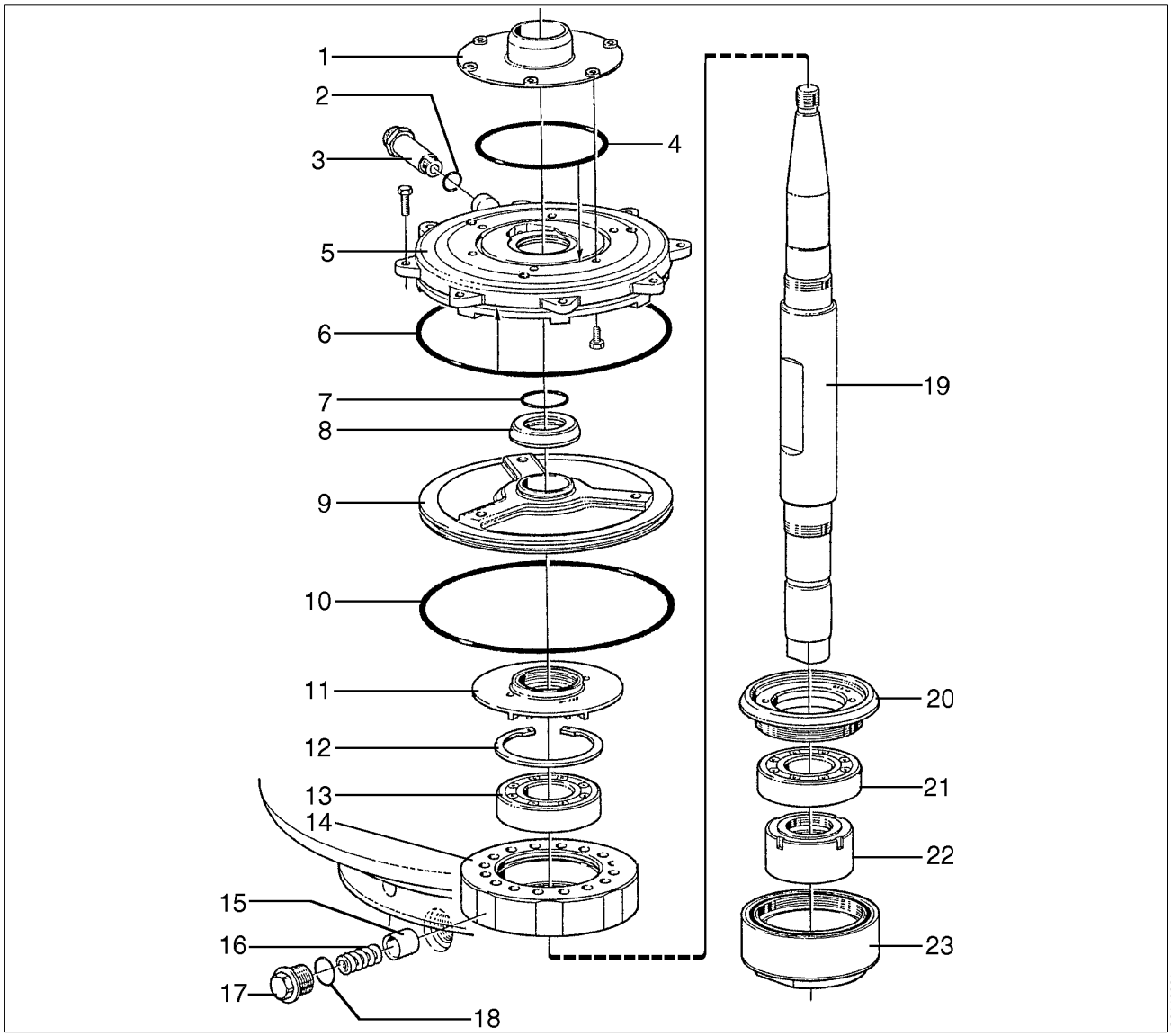
    - Make sure that the gasket on the safety device is in position (glue it with Loctite 407).

35. Fit the connecting hoses (be sure to fit their packings).



6.3 Vertical driving device

6.3.1 Exploded view

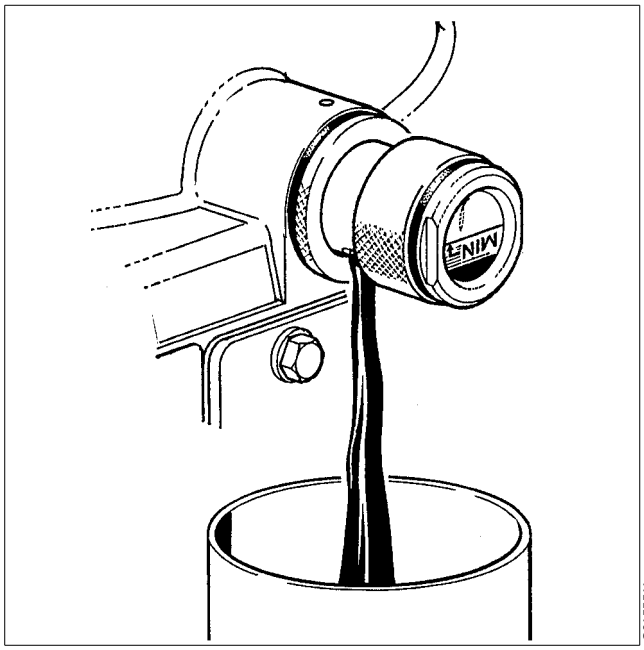


1. *Injection cover*
2. *O-ring*
3. *Nipple*
4. *O-ring*
5. *Distributing cover*
6. *O-ring*
7. *O-ring*
8. *Deflector ring*
9. *Top bearing cover*
10. *O-ring*
11. *Fan*
12. *Snap ring*
13. *Ball bearing*
14. *Bearing seat*
15. *Buffer*
16. *Spring*
17. *Screw plug*
18. *O-ring*
19. *Spindle*
20. *Lock ring*
21. *Ball bearing*
22. *Oil pump*
23. *Bottom bearing holder*

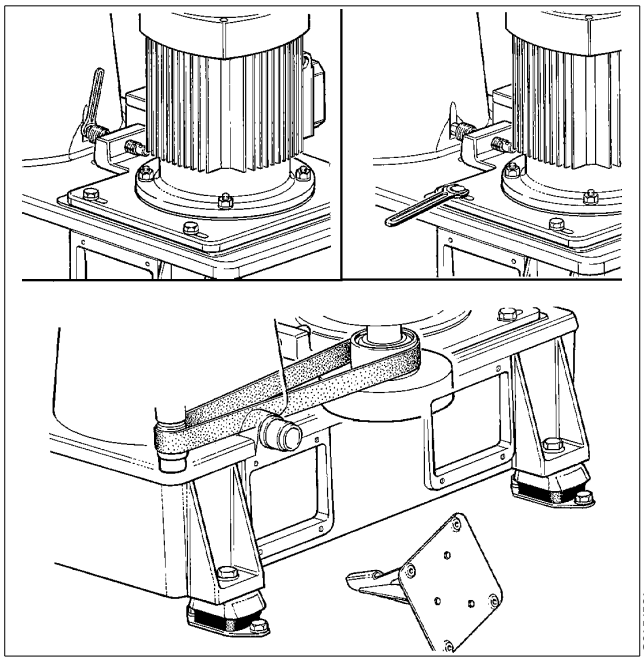
6.3.2 Dismantling

Dismantling of inlet/outlet, frame hood and bowl must have been performed. See chapter ‘‘6.2.2 Dismantling” on page 100.

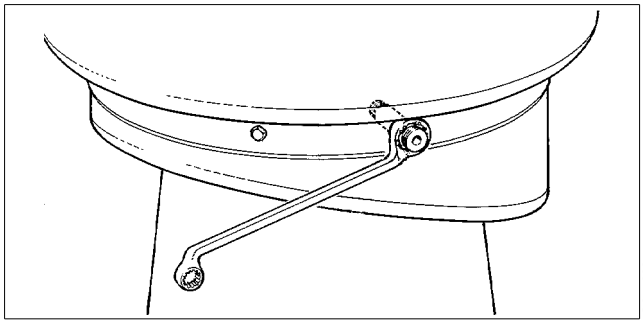
1. Empty the oil sump. See chapter ‘‘5.7.1 Oil change procedure” on page 84.



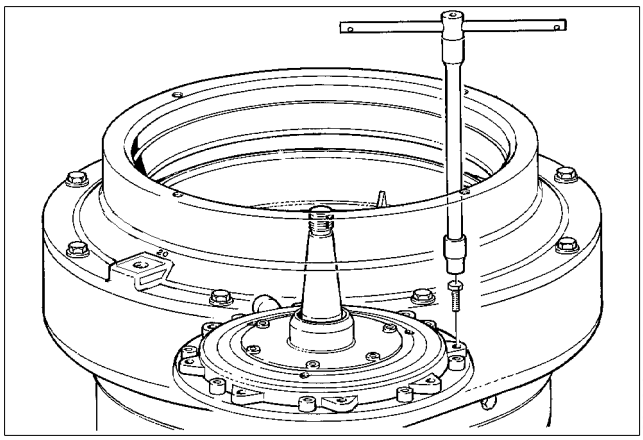
2. Remove the belt as follows:
   a. Remove the two covers from the frame bottom part.
   b. If not done screw back the belt tightener as far as possible from the frame.
   c. Loosen the motor adapter screws, but do not remove them.
   d. Remove the belt.



3. Unscrew and remove the nipple.

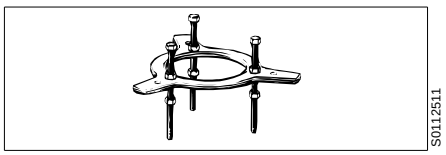


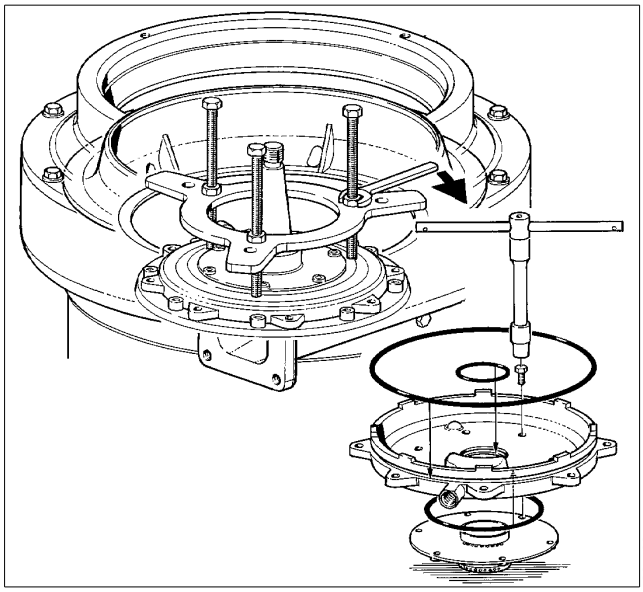
4. Remove the screws from the distributing cover.



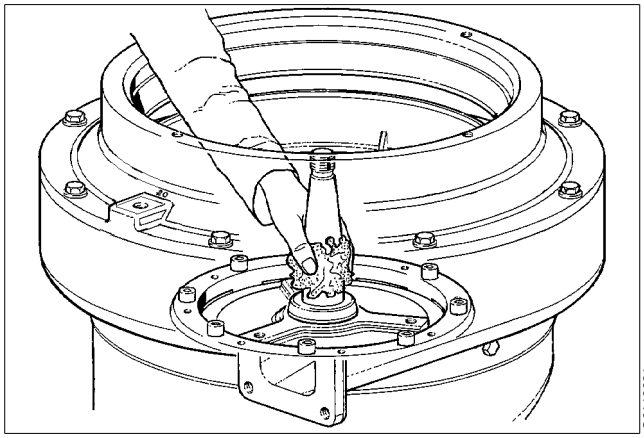
5. Place the ring of the dismounting tool on the flat surface of the frame top part. Fasten the screws of the tool in the distributing cover.

   - Loosen the cover by tightening the nuts one turn at a time.



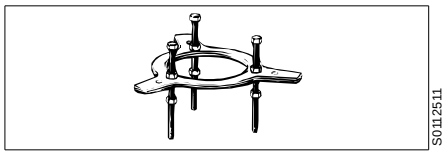


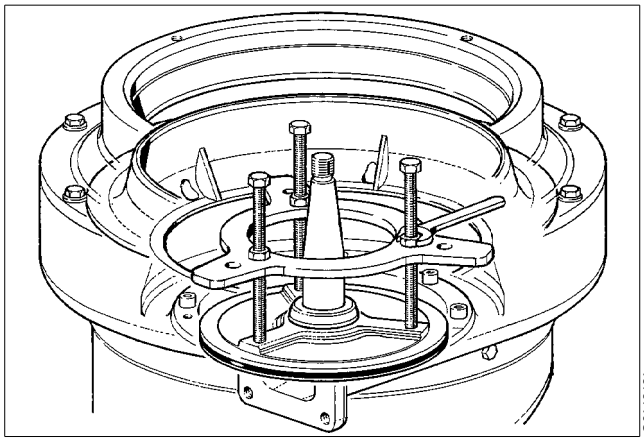
6. Wipe clean the cylindrical part of the bowl spindle.



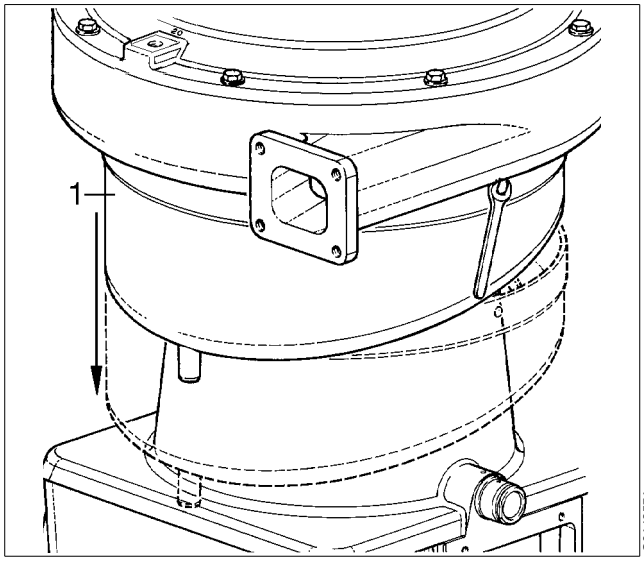
7. Place the ring of the dismounting tool on the flat surface of the frame top part. Fasten the screws of the tool in the top bearing cover.

   Loosen the cover by tightening the nuts one turn at a time. Lift off the cover together with the deflector ring.

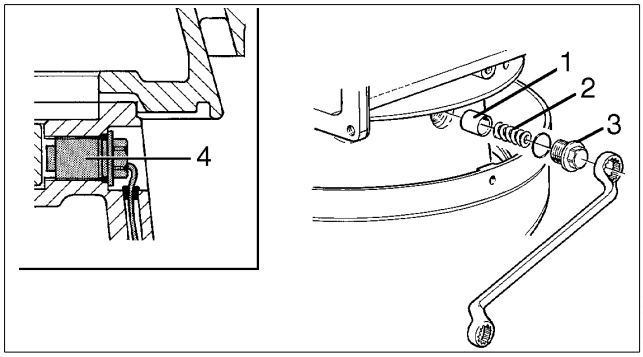




8. Remove the three screws from the collecting ring (1) and lower the ring.



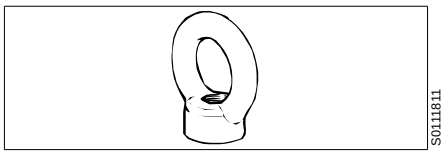
9. Unscrew and remove the screw plugs (3), springs (2) and buffers (1).

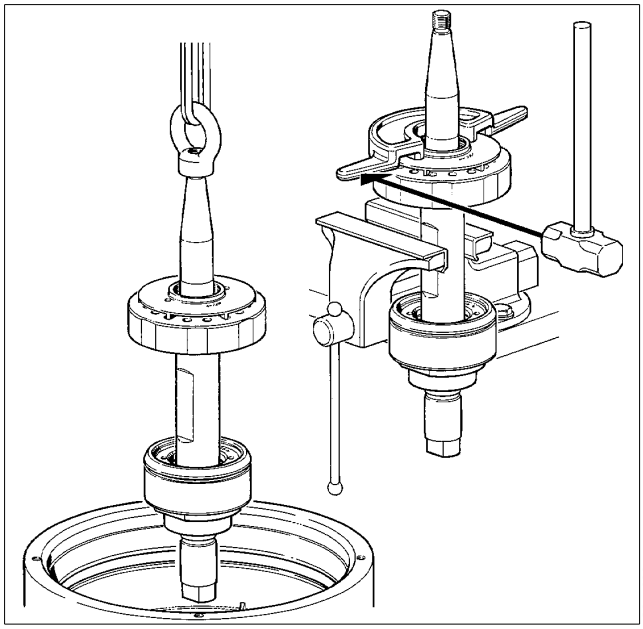


NOTE

The unbalance sensor (4) (if any) must not be removed.

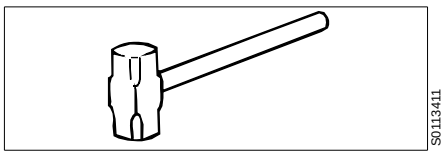
10. Fit the lifting eye onto the spindle and lift out using the hoist. Clamp the spindle in a vice (use the flat surface on the spindle).



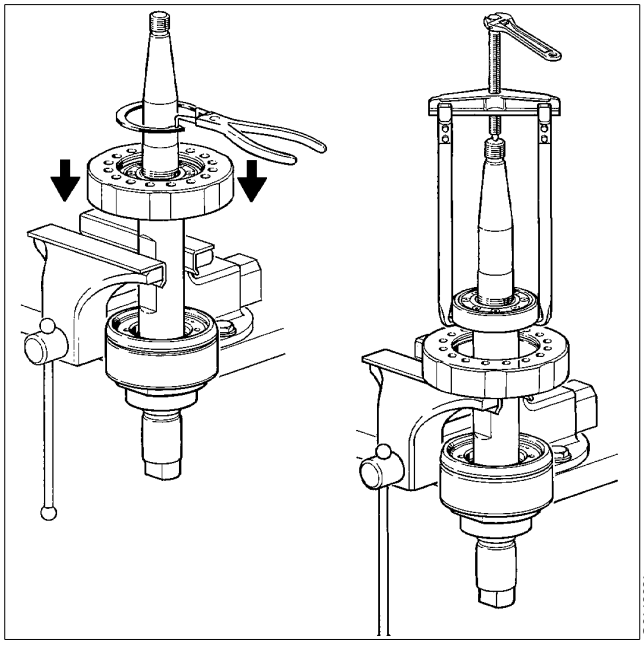


11. Fit the pin spanner and unscrew and remove the fan.

    Left-hand thread!



12. Remove snap ring and lower bearing seat. If necessary, tap carefully on the bearing seat with a soft hammer.



WARNING

Crush hazards

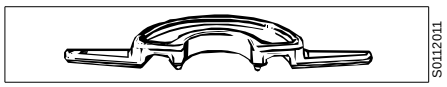
If the plier top is worn out the snap ring may rip off and parts may fall down.

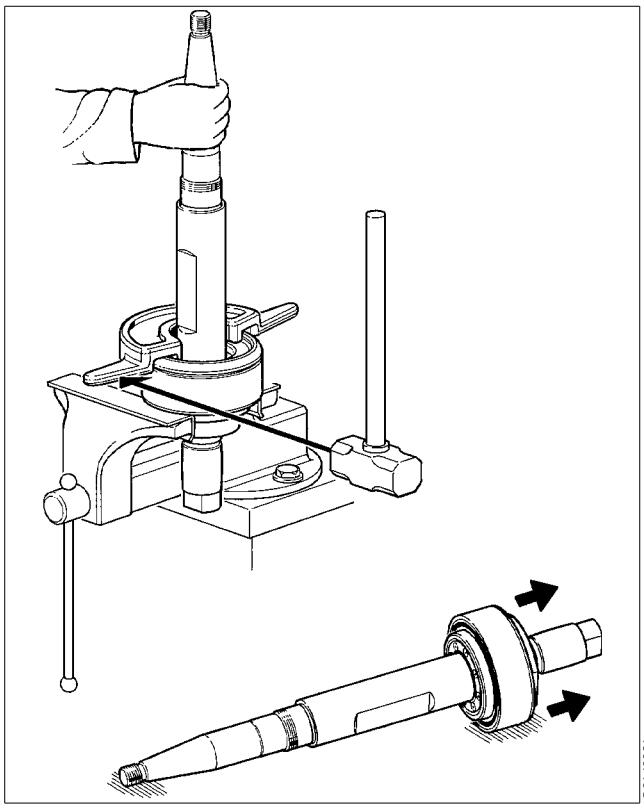
13. Pull off and discard the ball bearing.

14. Clamp the bottom bearing holder in the vice and unscrew the lock ring.

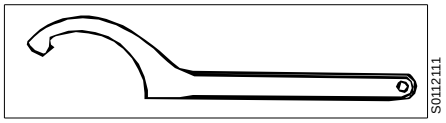
    Left-hand thread!

    Remove the bottom bearing holder by hand. Be very careful not to damage its race surfaces, unless the bottom bearing holder is to be replaced.

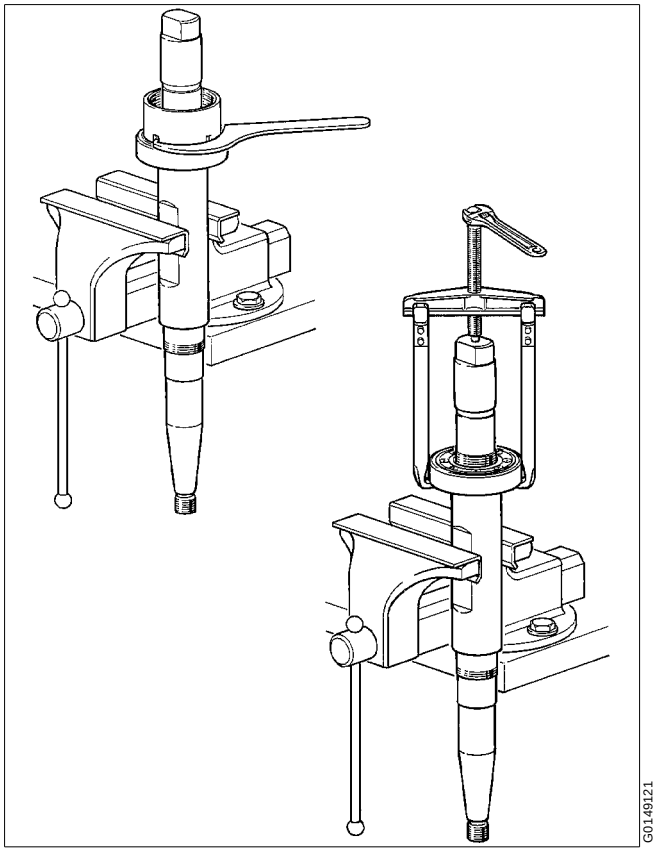




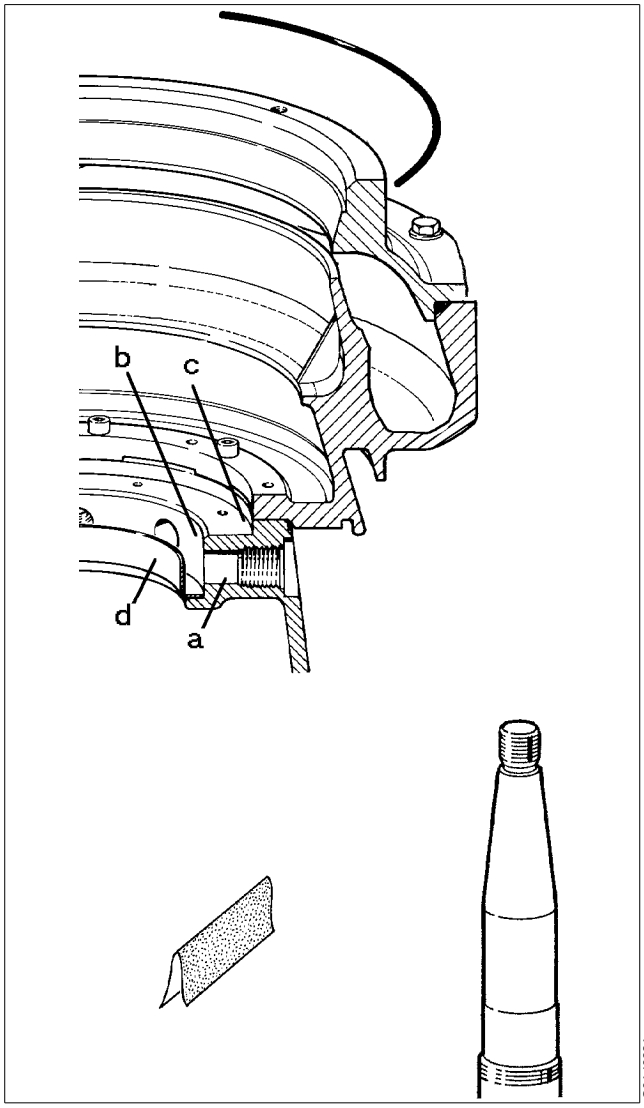
15. Turn the bowl spindle upside down and unscrew and remove the oil pump using the hook spanner.



16. Pull off and discard the ball bearing.



17. Clean all dismantled parts thoroughly in a degreasing agent. Pay special attention to the buffer seats (a), space (b) and surfaces (c, d) in the frame. See chapter “5.6 Cleaning” on page 79.
18. Clean the injection holes in the injection cover. Limestone deposits can be dissolved in a 10% acetic acid solution heated to 80 °C
19. Check for damage and/or corrosion on the spindle top. Remove any lime deposits on the spindle top with a very fine-grain emery cloth.



NOTE

For more information, see ‘‘5.4.2 Bowl spindle cone and bowl body nave” on page 66.

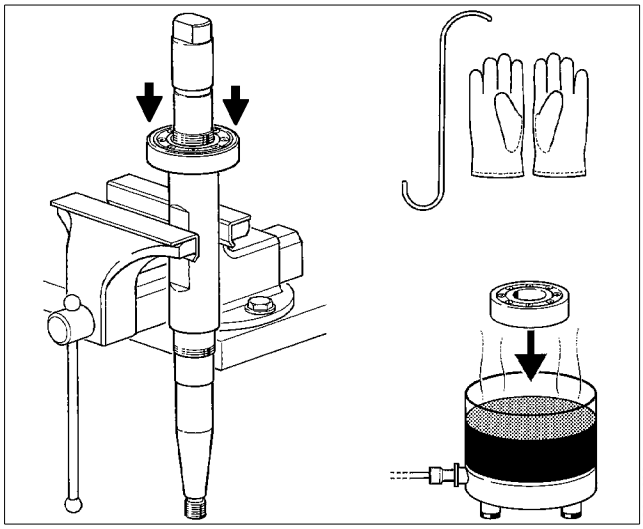
NOTE

Presence of black deposits on the spindle parts can indicate that another lubricating oil should be used, see chapter‘‘8.5.1 Lubrication chart, general” on page 188.

6.3.3 Assembly

✔ **Check point**
“5.3.3 Corrosion” on page 51,
“5.4.5 Buffer, buffer springs and bearing seat” on page 69.

1. Clamp the spindle in the vice upside down.
2. Heat a new ball bearing in clean oil to max. 125 °C. Fit the bearing.



WARNING

Burn hazards

Use protective gloves when handling the heated bearings.

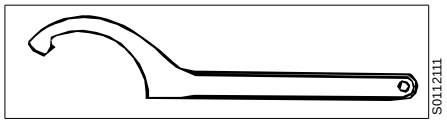
NOTE

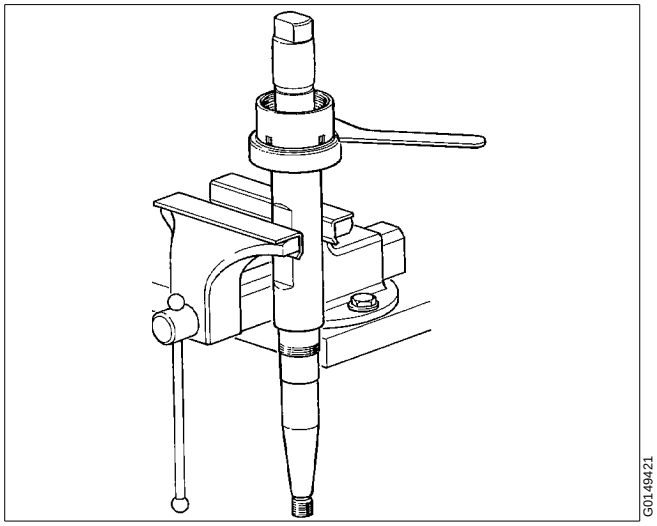
Never re-fit a used ball bearing.

NOTE

If any doubt how to mount roller bearings in a correct way, see the detailed description in chapter “5.11.1 Ball and roller bearings” on page 89.

3. When the bearing has cooled down, tighten the oil pump with the hook spanner.

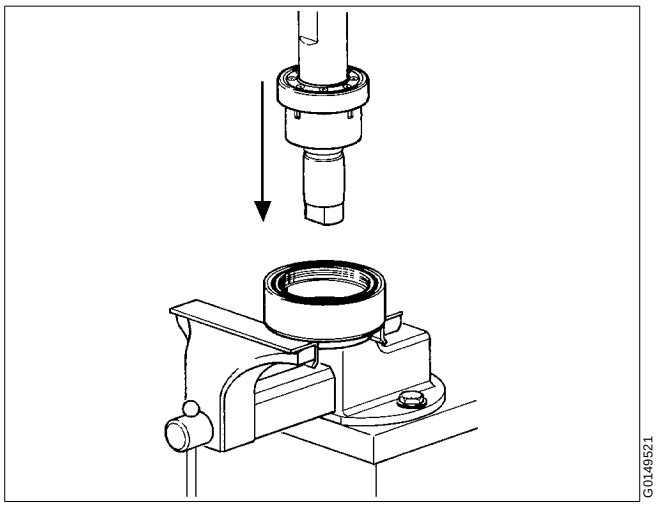




4. Lightly clamp the bottom bearing holder in the vice and lower the spindle.

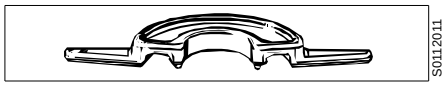
NOTE

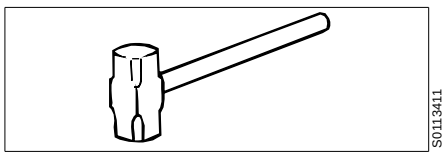
Clamping too tightly can deform the holder preventing the ball bearing from entering it.

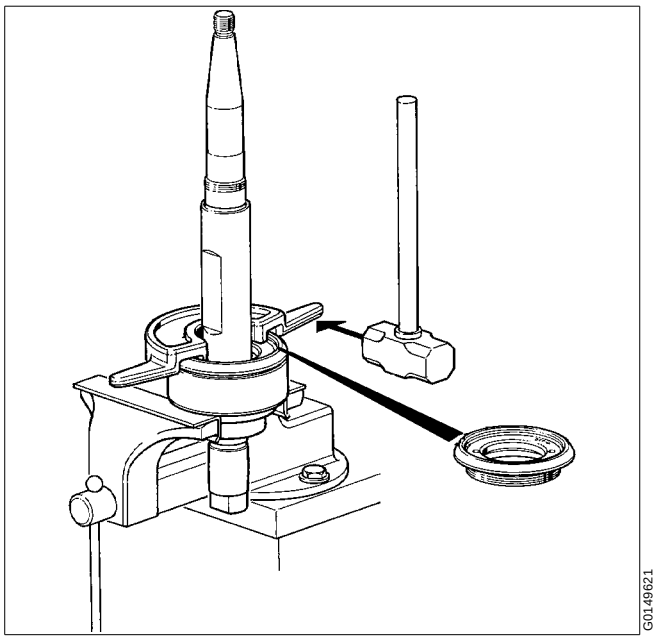


5. Fit and tighten the lock ring with the pin spanner.

Left-hand thread!





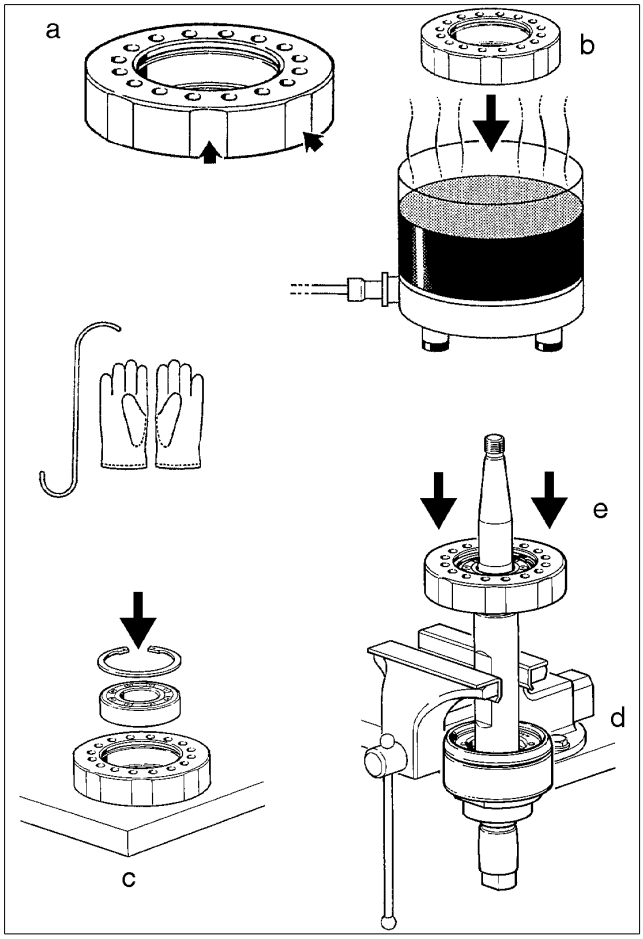


6. Fit the upper ball bearing as follows:

   a. Examine the contact surfaces for the buffers on the bearing seat. If they are damaged, carefully remove any high spots on the surface using a fine single-cut file.

   b. Heat the bearing seat in clean oil to maximum 125 °C.

   c. Fit a new ball bearing in the bearing seat and lock it with snap ring. Heat the assembled unit in clean oil to max. 125 °C.



WARNING

Crush hazards

If the plier top is worn out the snap ring may rip off and parts may fall down.

   d Clamp the vice over the upper parts of the flats on the bowl spindle.

   e Lower the heated unit until the ball bearing rests on the shoulder of the bowl spindle.

WARNING

Burn hazards

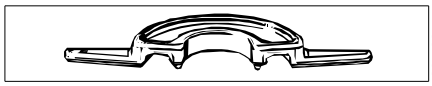
Use protective gloves when handling the heated bearings.

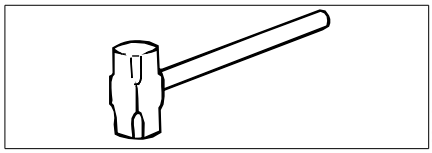
NOTE

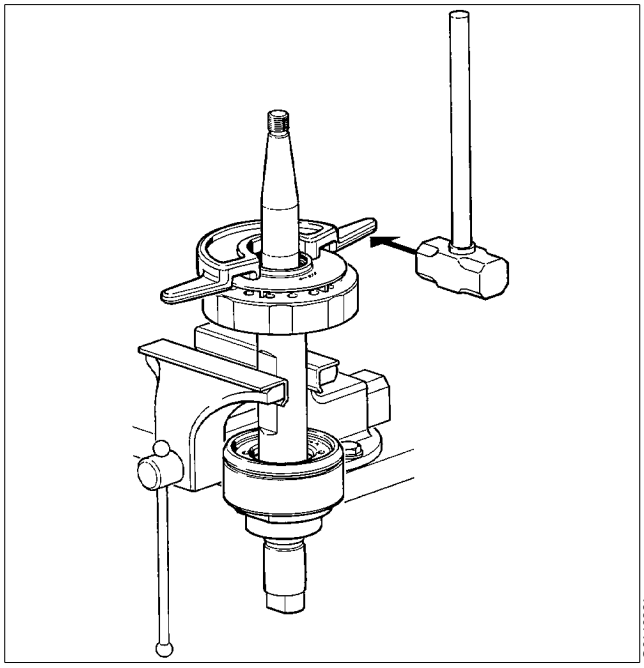
Never re-fit a used ball bearing.

7. When the heated unit has cooled down, screw on and tighten the fan with the pin spanner.

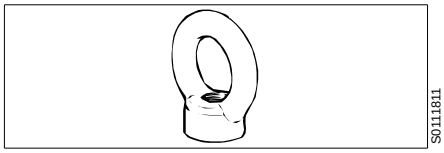
   Left-hand thread!







8. Fit the lifting eye onto the spindle.



9. Lower the bowl spindle carefully into the separator frame. Make sure that the bearing seat flats are in front of the buffer holes.

   Tap the spindle top carefully with a tin hammer to ensure that the spindle reaches its correct bottom position. Rotate the spindle by hand and check that it rotates freely.

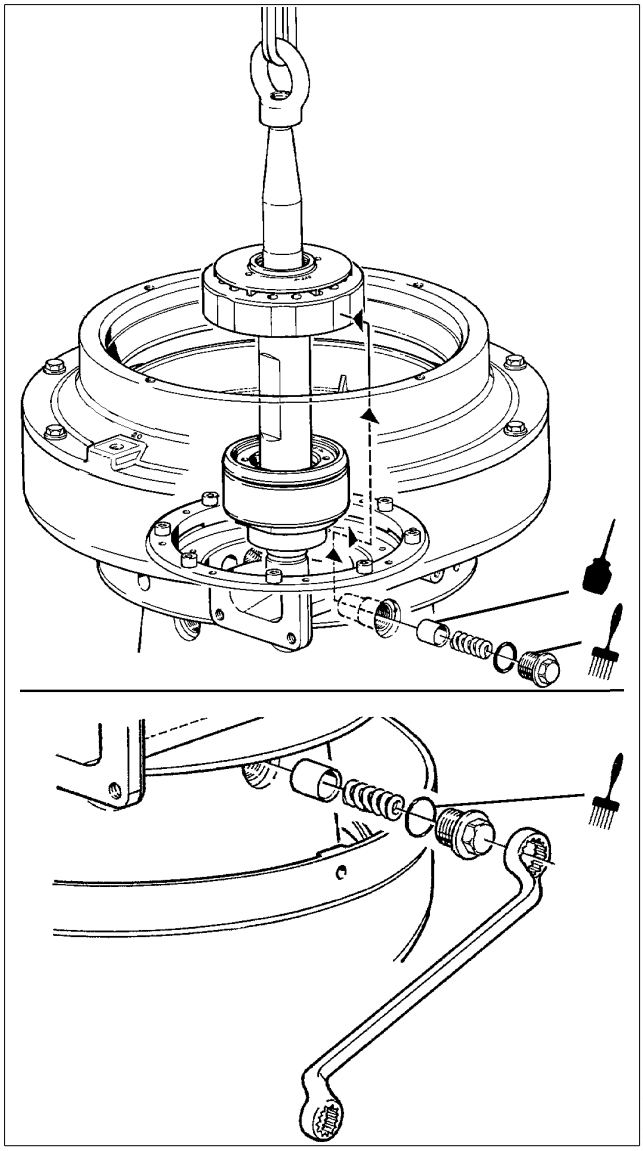
10. Fit the buffers, springs and screw plugs.

    a. Apply oil to the buffers by placing them in an oil bath.

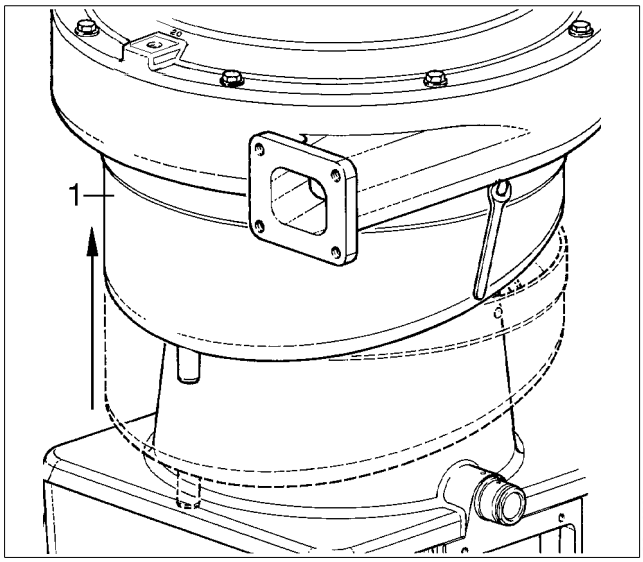
    b. Lubricate the O-rings and screw plugs, see chapter “8.5 Lubricants” on page 188.

    c. Fit the buffers and springs. Fit the O-rings and tighten the screw plugs crosswise a few turns at a time. Finally tighten firmly all around.

✔ **Check point**
“5.4.3 Bowl spindle; radial wobble” on page 66.



11. Lift upp the collecting ring (1) and tighten its three screws.



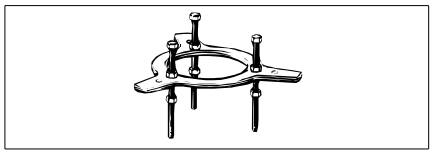
12. Fit top bearing cover.

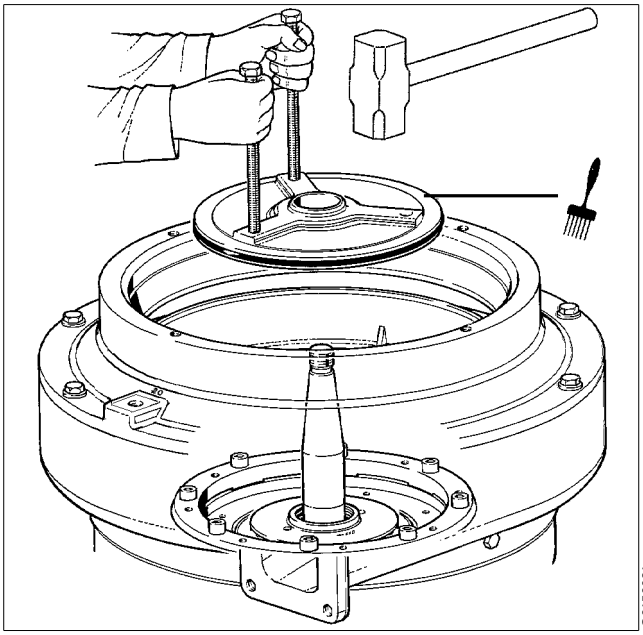
    a. Lubricate the guide surface of the bearing cover, see chapter ‘‘8.5 Lubricants” on page 188

    b. Place the top bearing cover with its O-ring in position by using two of the dismounting tool screws.

    c. When in position, tap around the cover with a tin hammer to ensure a proper fit.

    d. Rotate the spindle by hand and check that it rotates freely.



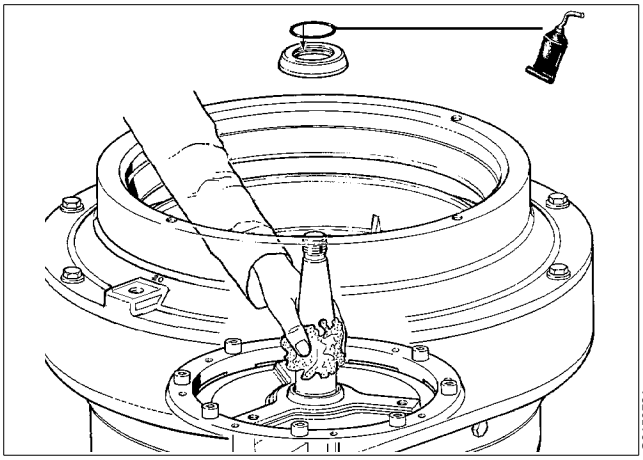


13. Fit the deflector ring with O-ring.

    a. Wipe clean the cylindrical part of the bowl spindle.

    b. Lubricate the O-ring with silicone grease, see chapter ‘‘8.5 Lubricants” on page 188.

    c. Rotate the spindle by hand and check that it rotates freely.

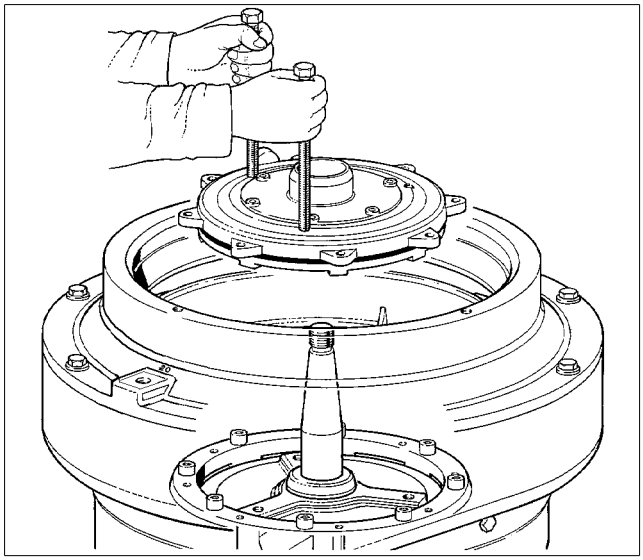


14. Fit distributing cover.

    a. When carrying out a Major Service (MS), renew all the O-rings in the distributing cover. For access to two of these O-rings, remove the screws of the injection cover.

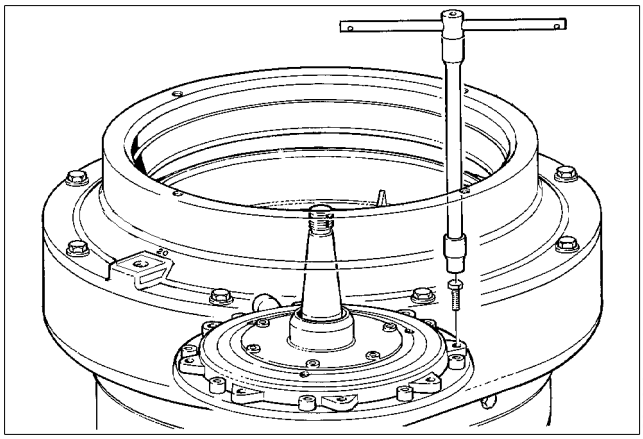
    b. Refit the injection cover after renewing the O-rings.

    c. Place the distributing cover with its O-rings in position by using two of the dismounting tool screws.

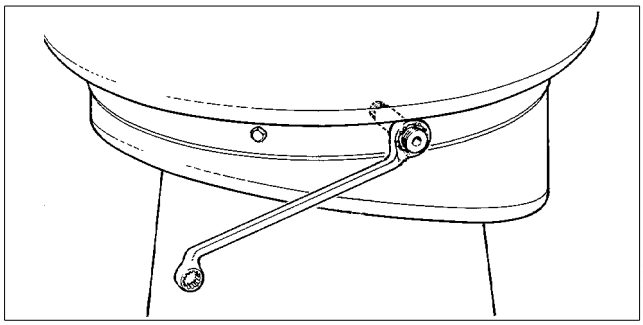


15. Tighten the screws of the distributing cover lightly crosswise. Finally tighten firmly all around.

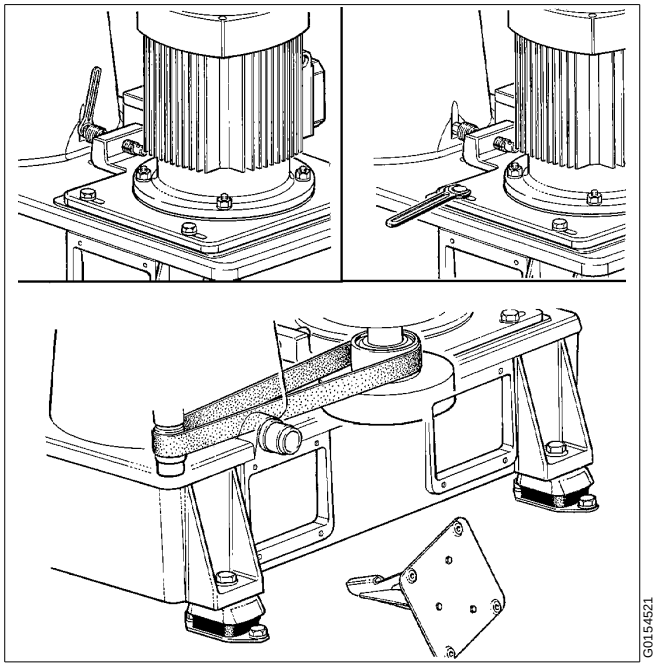
    Rotate the spindle by hand and check that it rotates freely.



16. Fit and tighten the nipple with the O-ring.



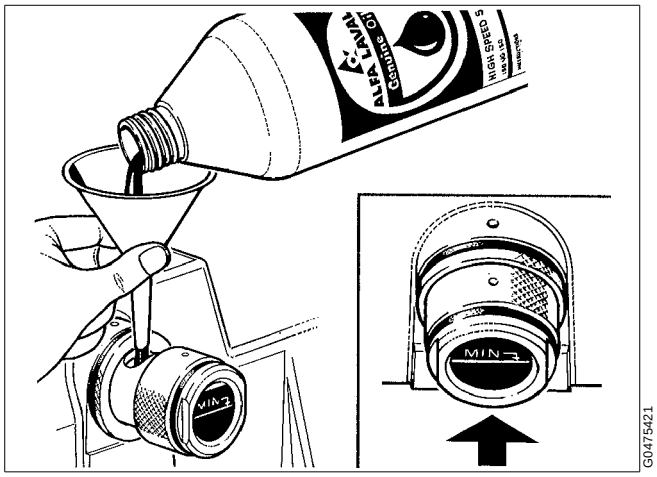
17. Fit and tighten the flat belt.



NOTE

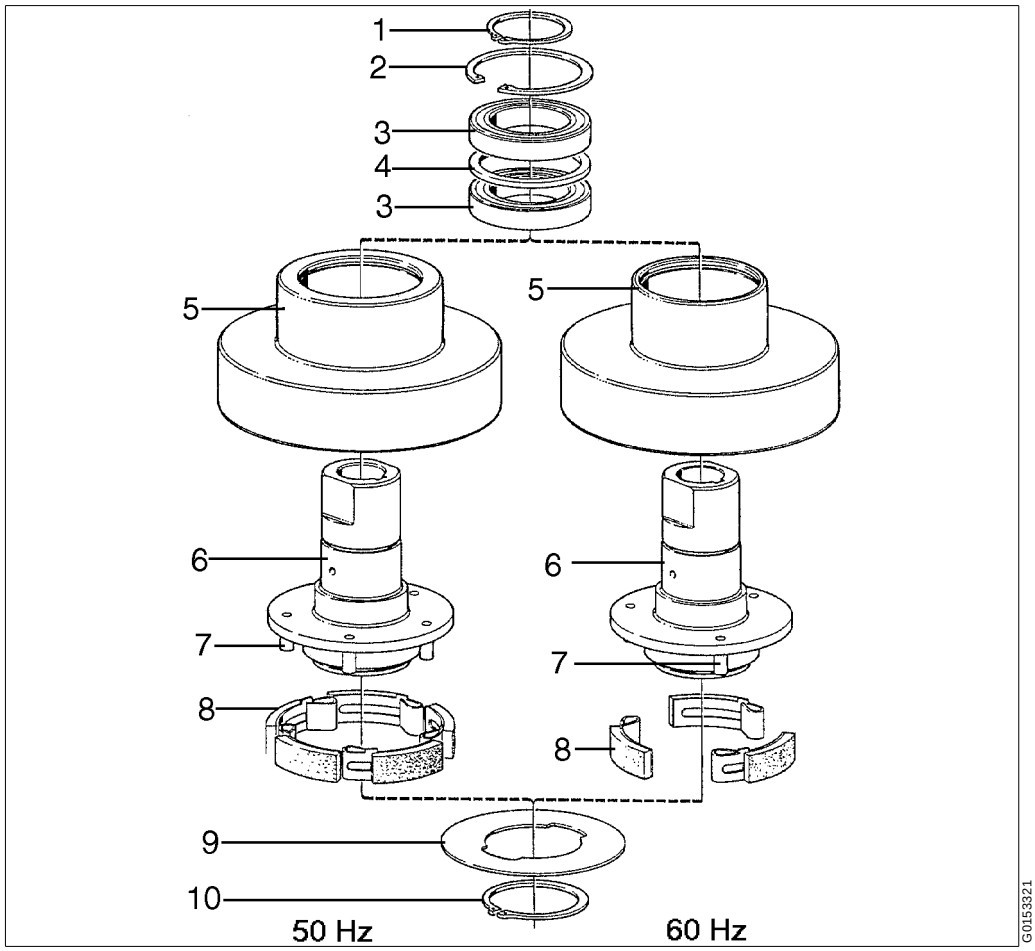
It is important to follow the flat belt tightening procedure described in chapter “6.5 Flat belt” on page 149.

18. Fill the oil sump with oil. See chapter “5.7.1 Oil change procedure” on page 84.



6.4 Friction coupling

6.4.1 Exploded view



1. *Snap ring*
2. *Snap ring*
3. *Ball bearing*
4. *Spacing ring*
5. *Belt pulley*
6. *Coupling hub*
7. *Parallel pin*
8. *Friction block*
9. *Cover*
10. *Snap ring*

6.4.2 Dismantling

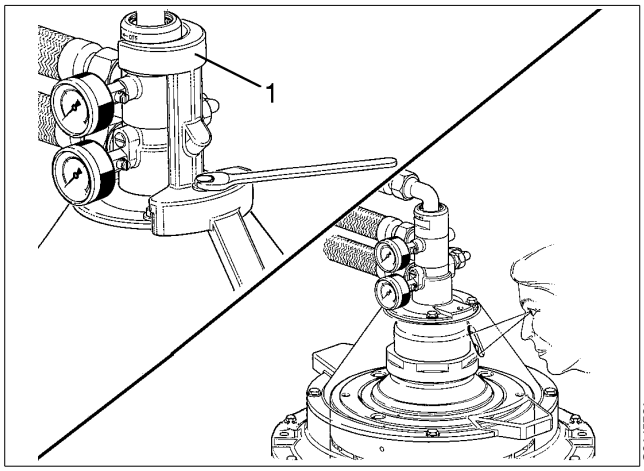
DANGER

Entrapment hazards

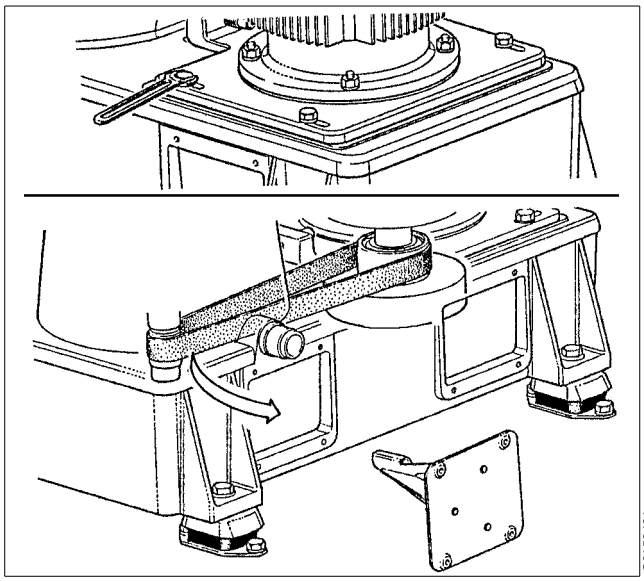
Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

Remove safety device (1) and look through the slot in the frame hood to see if the bowl still rotates.

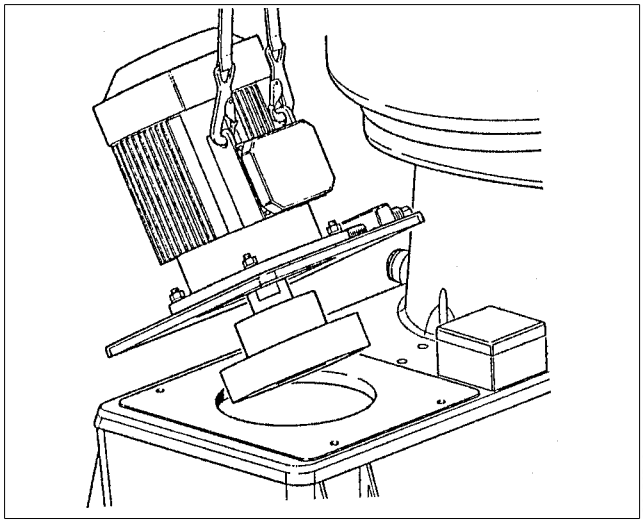
To avoid accidental start, switch off and lock power supply before starting any dismantling work.



1. Remove the motor adapter screws.
2. Remove the two covers from the frame bottom part. Remove the belt.



3. Use a sling to remove the motor together with its adapter and the friction coupling.
   - Weight of motor including adapter and friction coupling: approx. 90 kg.



DANGER

Electrical hazards

Always disconnect the electrical cables before lifting the motor.

Not disconnecting may damage the cables during the lifting procedure.

DANGER

Crush hazards

Place the motor on a suitable pallet on the floor when doing maintenance work.

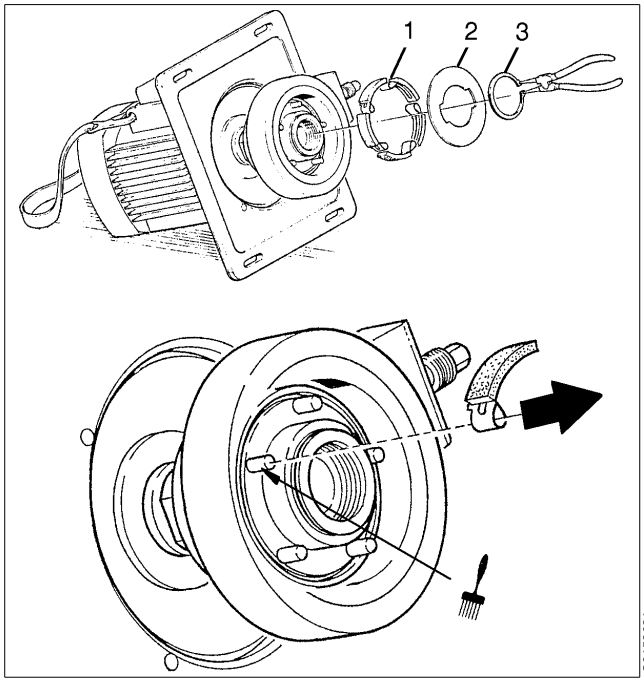
If the separator frame is used as a work bench the motor may slip of the frame and cause serious accident.

4. Remove the snap ring (3), cover (2) and friction blocks (1).

✔ **Check point**
“5.4.6 Coupling friction blocks” on page 70.

Clean the pins of coupling hub and apply a **thin** film of lubricating paste on the pins, see chapter “8.5 Lubricants” on page 188.

If too much paste is applied, the surplus will collect in the friction coupling and can cause operating problems.

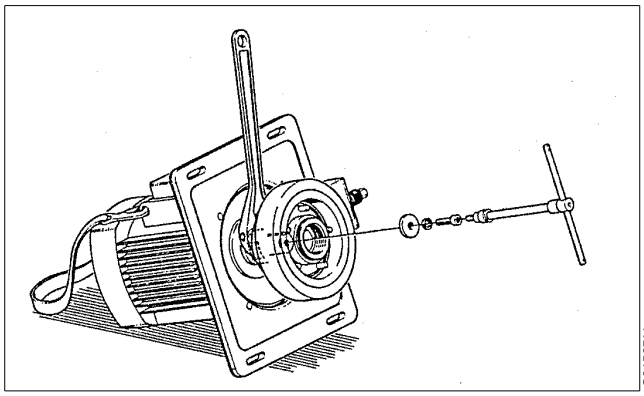


NOTE

If the friction coupling not need to be dismantled, proceed to section “ Assembly of friction blocks” on page 147.

Complete dismantling of friction coupling

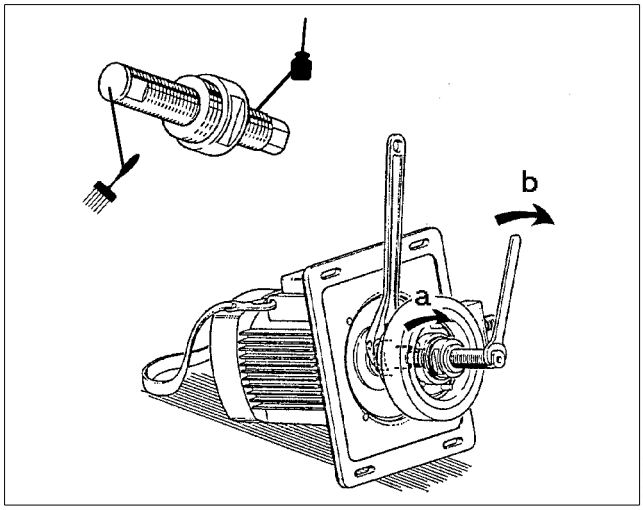
5. Remove the screw, spring washer and washer from the end of the motor shaft.



6. Lubricate the tool for friction coupling, see chapter “8.5.4 Recommended lubricants” on page 193.

   a. Fit (a) the tool onto the friction coupling.

   b. Ease off the friction coupling (b). Use an adjustable wrench on the coupling hub to prevent rotation during dismantling.

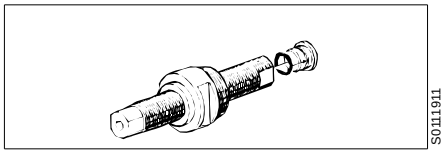


WARNING

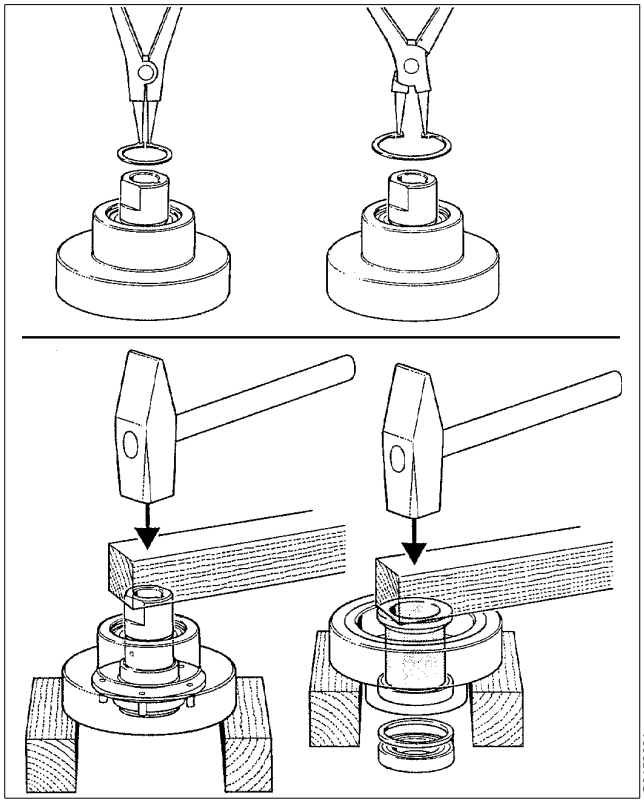
Crush hazards

Pay attention to the friction coupling.

When it come loose from the motor shaft it may fall down and injure due to heavy weight.

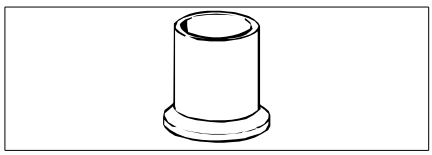


7. Remove the snap rings and drive off the coupling hub. Turn the coupling the other way round and drive off the ball bearings and the spacing ring by using the mounting tool (turned upside down). Discard the bearings.



NOTE

Never re-fit used ball bearings.



8. Clean all parts thoroughly in a suitable cleaning agent. See chapter “5.2 Maintenance Logs” on page 44 and “5.6 Cleaning” on page 79.

6.4.3 Assembly

✔ **Check points**
"5.3.3 Corrosion" on page 51.

1. Slip the belt pulley over the coupling hub and place them on a firm and level foundation.
2. Apply a thin film of oil on the external and internal surfaces of the ball bearings.

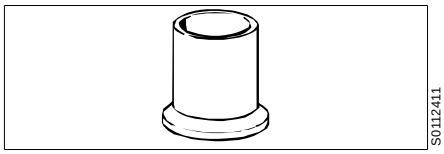
WARNING

Disintegration hazard

If the belt pulley must be renewed, check that the new pulley has correct diameter. An incorrect pulley will cause the separator bowl to run at an excessive or insufficient speed.

- Diameter d =134 mm is used for 50 Hz power supply.
- Diameter d=112 mm is used for 60 Hz power supply.

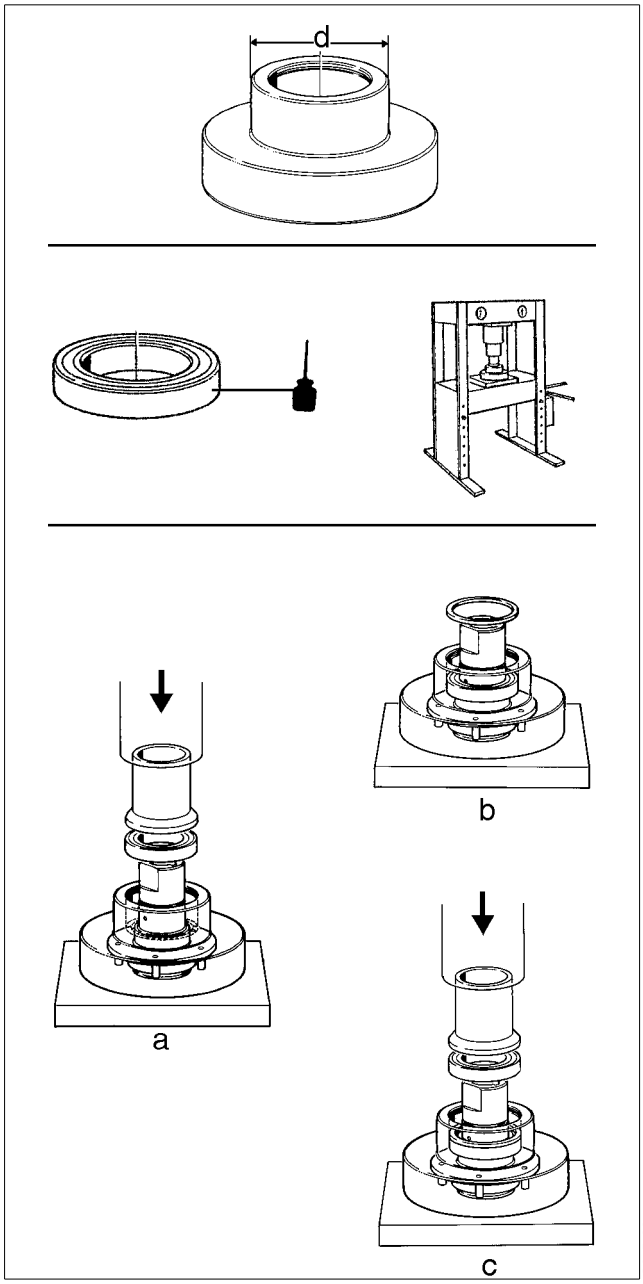
3. Press the ball bearings down one at a time in the coupling hub, preferably using a hydraulic press. Place the spacing ring between them. See sequence in illustration.



NOTE

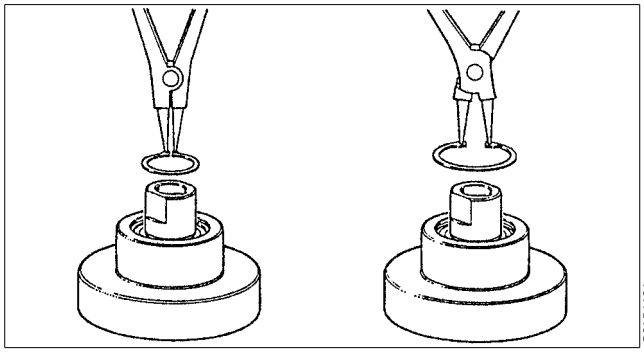
Never re-fit used ball bearings.

The ball bearings must not be heated as they are packed with grease and sealed with plastic membranes.



50 Hz: d = 134 mm
60 Hz: d = 112 mm

4. Fit the snap rings.

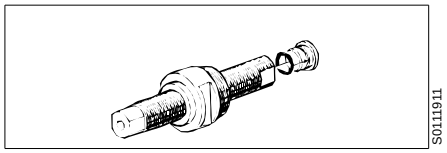


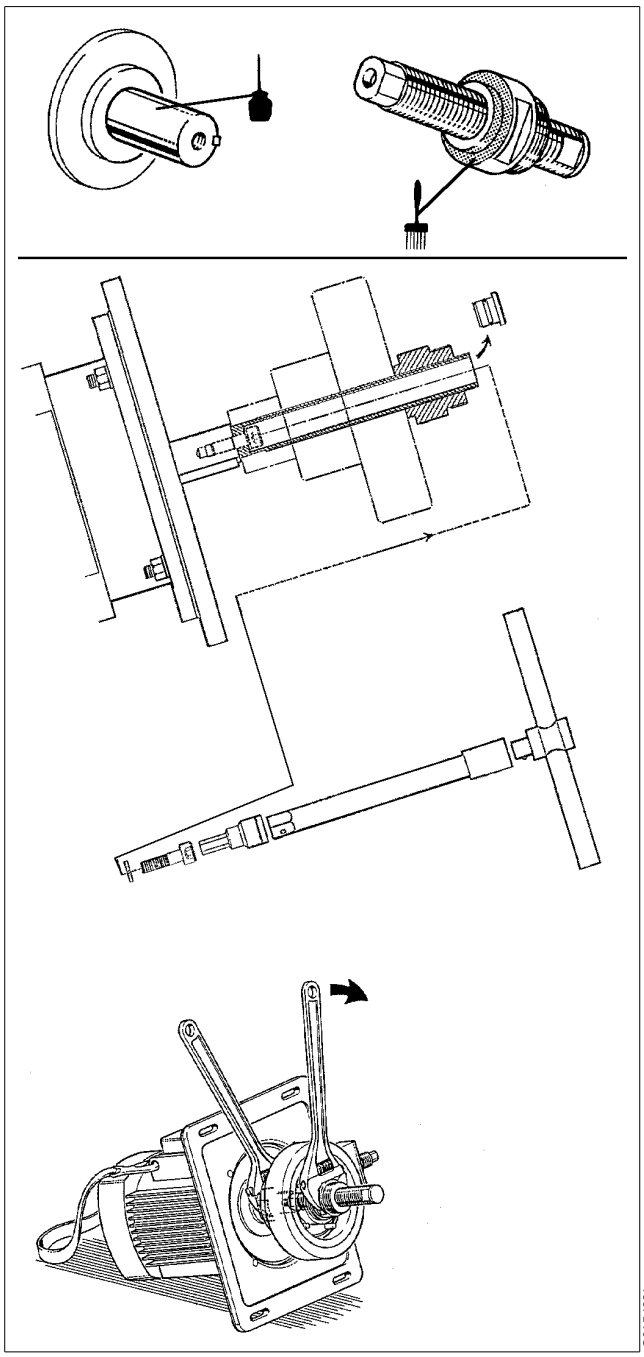
5. Use the tool for friction coupling when pressing the friction coupling on to the motor shaft.

   a. Clean the motor shaft and apply a thin oil film on it.

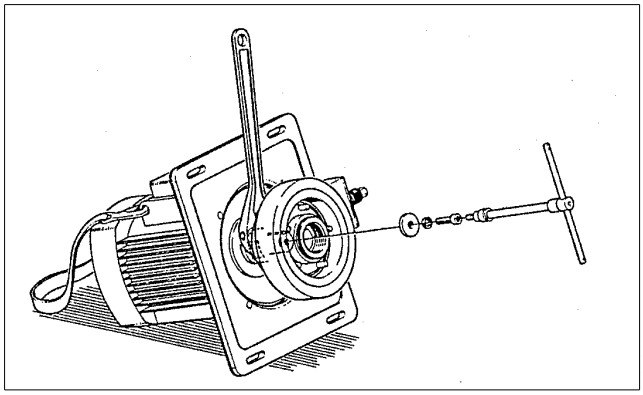
   b. Apply lubricating paste to the surface of the tool nut that slides on the coupling hub when pressing. See chapter “8.5.4 Recommended lubricants” on page 193.

   c. Fasten the sleeve of the tool to the motor shaft by means of the screw that attaches the friction coupling to the motor. Press the friction coupling on to the shaft.



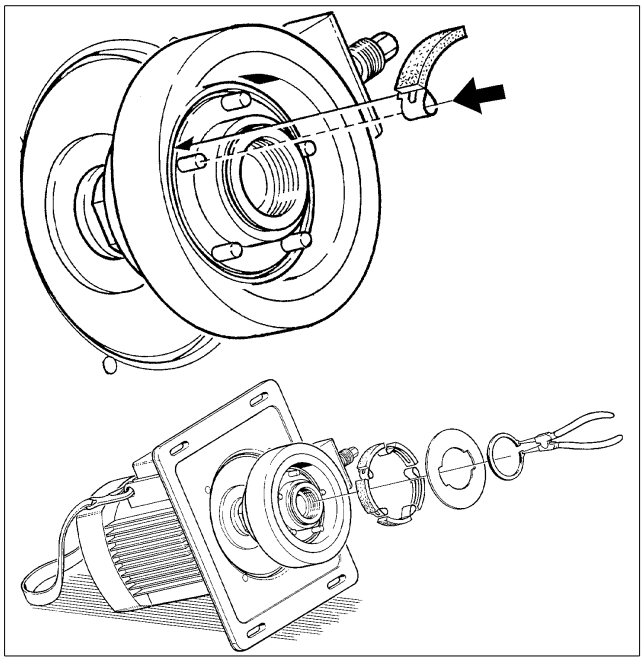


6. Fit the screw with washer and spring washer to secure the friction coupling.



Assembly of friction blocks

7. Fit friction blocks.



NOTE

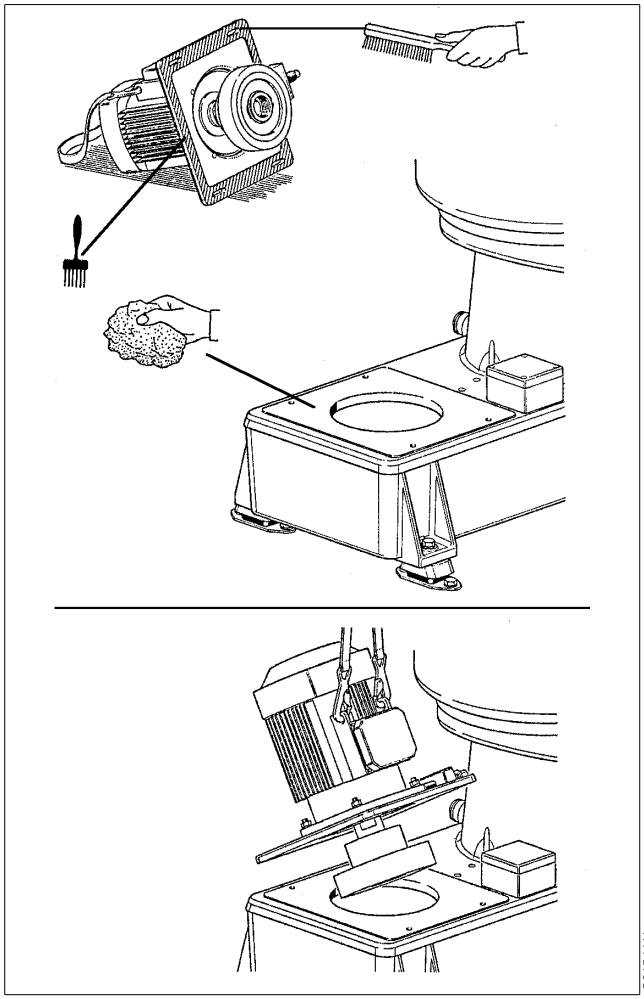
The guide lug of the friction block must enter in the circular groove of the coupling hub. In this position, the guide lug limits the deflection of the friction block, thus preventing excessive wear on the pad.

8. Place the cover in position and secure it with the snap ring.

9. Fit the motor.

   a. Degrease and clean the contact surfaces of the separator frame and motor adapter.

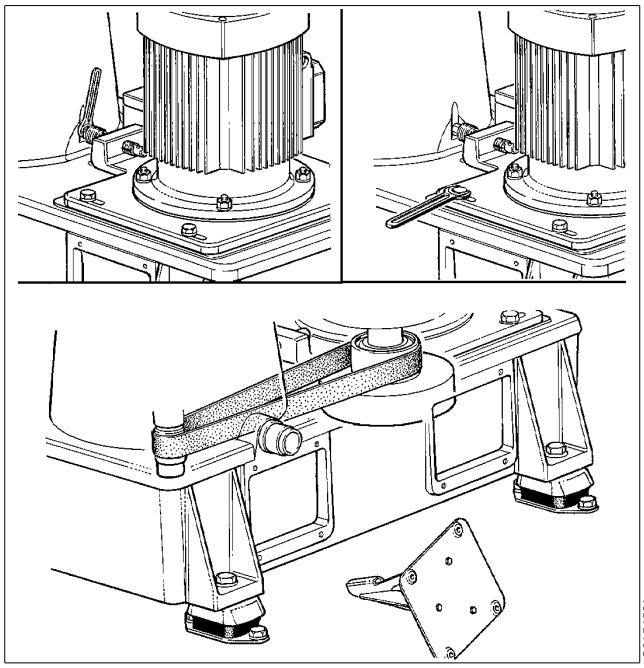
   b. Lubricate the motor adapter and lower the motor with adapter and friction coupling onto position (approx. weight 90 kg). See chapter “8.5.4 Recommended lubricants” on page 193.



10. Fit and tighten the flat belt.

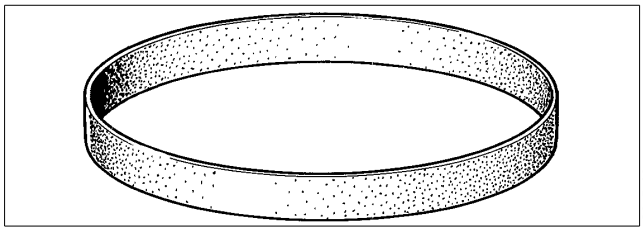
NOTE

It is important to follow the flat belt tightening procedure described in chapter “6.5 Flat belt” on page 149.



6.5 Flat belt

The flat belt must be removed for dismantling of the bowl spindle and the friction coupling, or for replacement with a new belt.



A new belt must be retightened twice:

- after 30 minutes. The separator **must not** be started until the retightening has been made.
- after approximately 24 hours of operation.

NOTE

The separator must not be started until the retightening after 30 minutes has been made. If starting, the belt may slip and be damaged.

6.5.1 Belt replacement

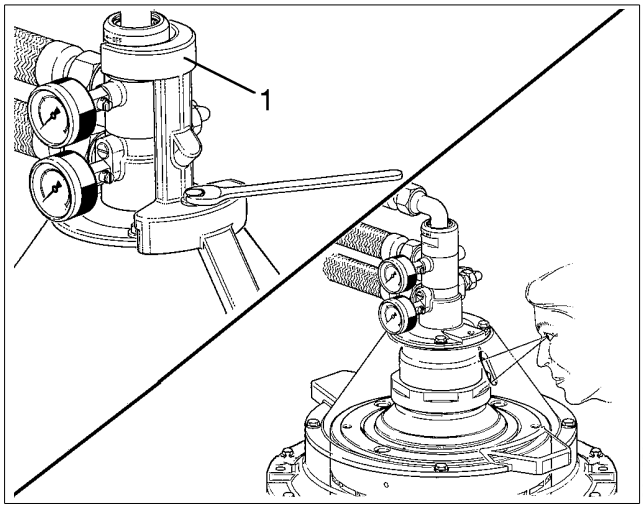
DANGER

Entrapment hazards

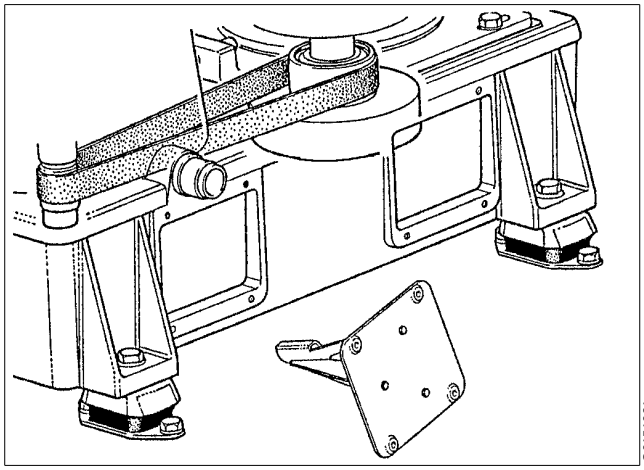
Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

Remove safety device (1) and look through the slot in the frame hood to see if the bowl still rotates.

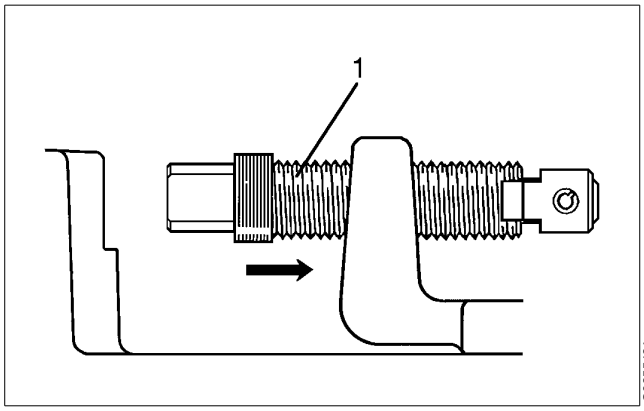
To avoid accidental start, switch off and lock power supply before starting any dismantling work.



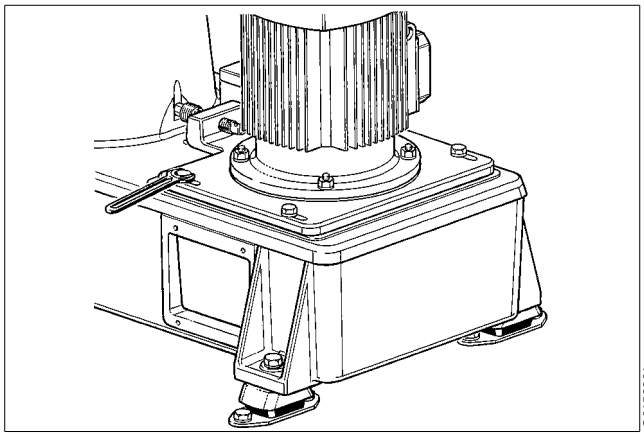
1. Remove the two covers from the frame bottom part.



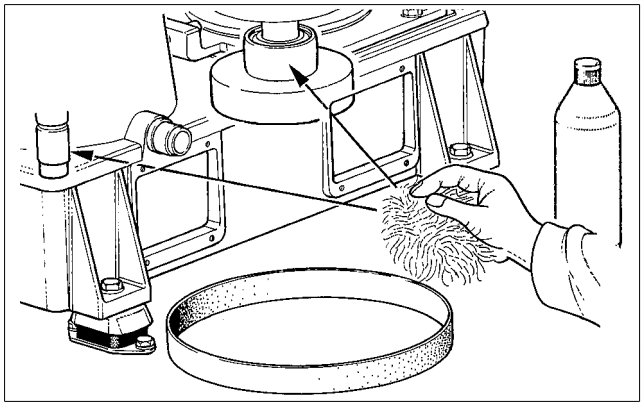
2. Screw back the belt tightener as far as possible from the frame by rotating the sleeve (1) counter clockwise.



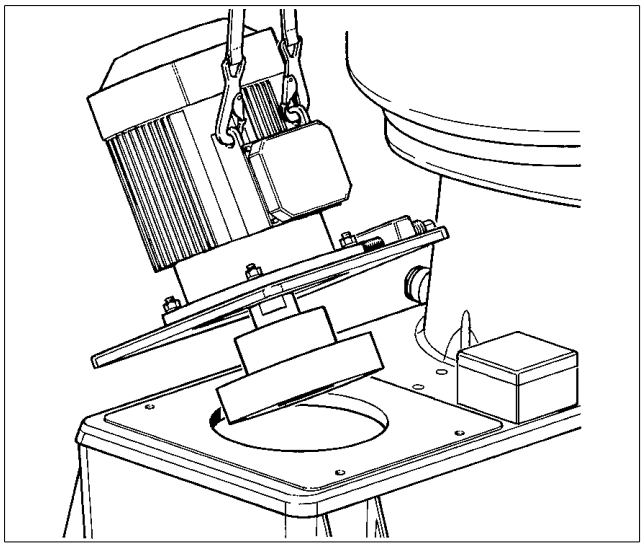
3. Loosen and remove the motor adapter screws.



4. Remove the existing belt and clean the raceways of the bowl spindle and the friction coupling by using a degreasing agents, see chapter “5.6 Cleaning” on page 79. Wipe the raceways with a clean rag after cleaning.
   - Exercise the greatest possible cleanliness. There must be no dirt, oil or grease on the raceways.



5. Lift the motor together with adapter and friction coupling and check that there is a sufficient film of lubricating paste, between the adapter and the frame surface, see chapter “8.5.4 Recommended lubricants” on page 193. Lower the motor after checking.
   - Weight of motor including adapter and friction coupling: approximately 90 kg.



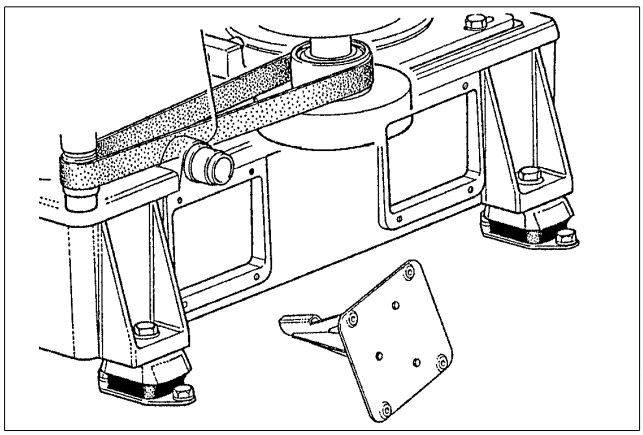
DANGER

Electrical hazards

Always disconnect the electrical cables before lifting the motor.

Not disconnecting may damage the cables during the lifting procedure.

6. Fit a new belt. Start on motor side. Tighten the belt by moving the motor backwards by hand. Pull the belt around a few turns by hand.



CAUTION

Crush hazards

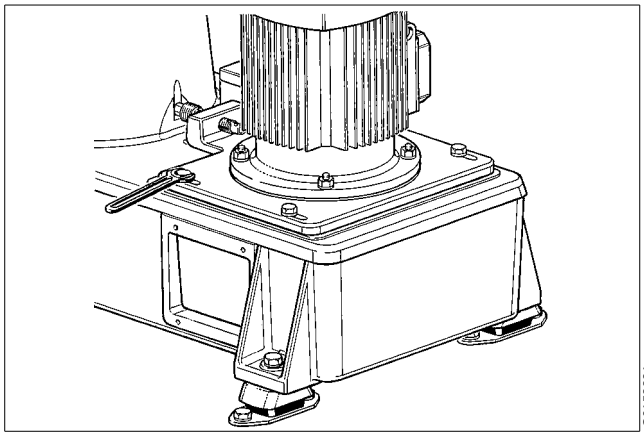
Rotating the bowl by pulling the flat belt by hand may cause injuries to fingers.

7. Tighten the belt (see next section).

6.5.2 Tightening of flat belt

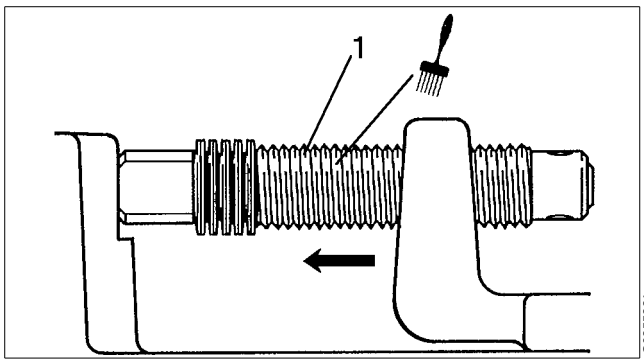
1. Loosen but do not remove the motor adapter screws (if not already done).

   Make sure that there is a sufficient film of lubricating paste between the motor adapter and the frame surface, see chapter “8.5.4 Recommended lubricants” on page 193.

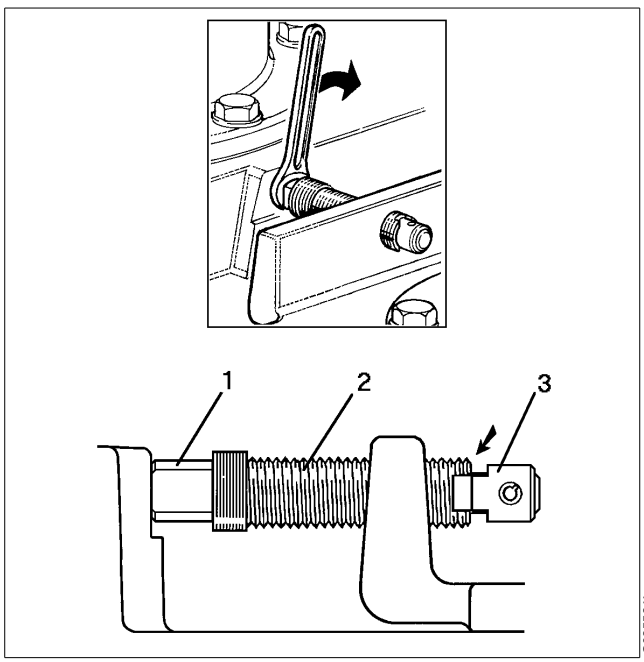


2. Rotate the belt tightener by rotating the sleeve (1) until it makes contact with the frame pad.

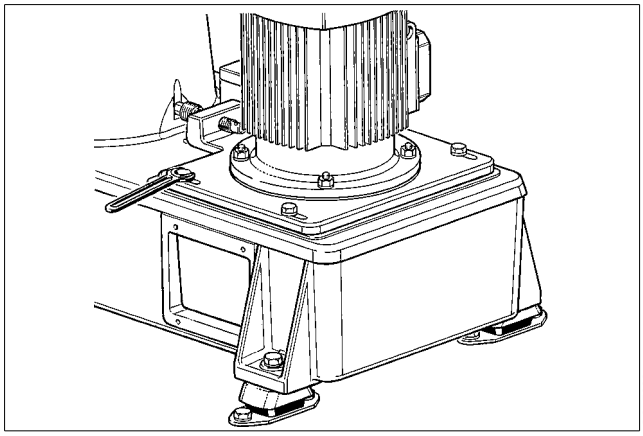
   The threads should be lubricated, see chapter“8.5.4 Recommended lubricants” on page 193.



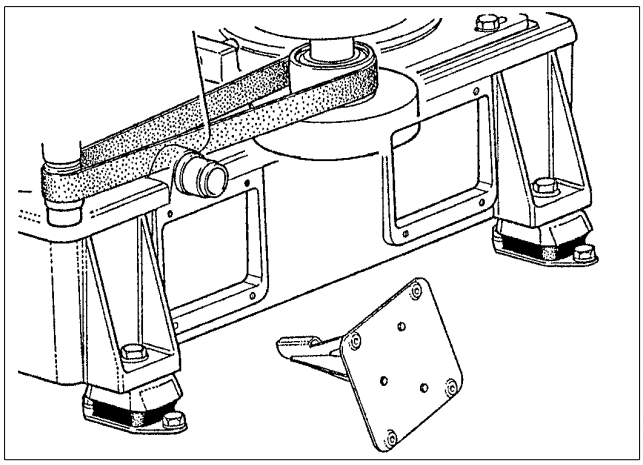
3. Tighten shaft (1) until sleeve (2) and dog (3) are disengaged. “Shake” the motor by hand several times during this operation in order to overcome the friction between the motor adapter and the frame. The belt is now correctly tightened.



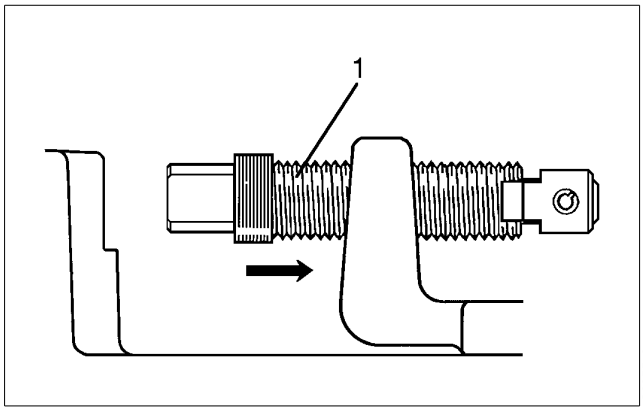
4. Tighten the motor adapter screws.



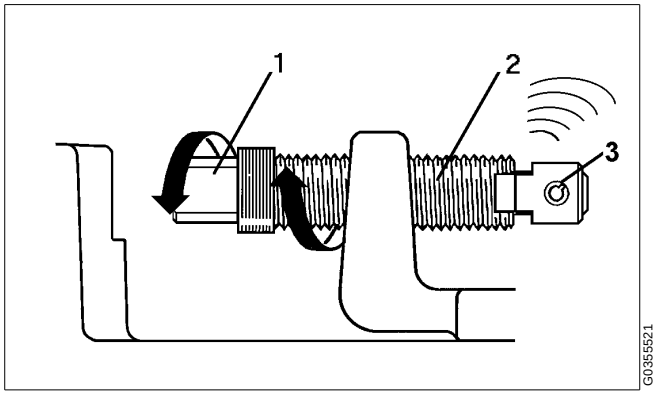
5. Fit the two covers on the frame bottom part.



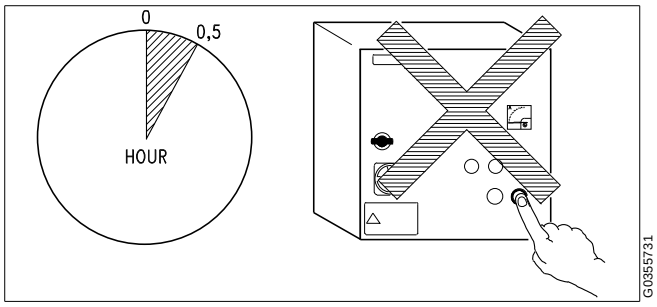
6. Screw back the belt tightener as far as possible from the frame by rotating the sleeve (1) counter clockwise.



7. Rotate the shaft (1) relative to the sleeve (2) until the sleeve and dog (3) are engaged again with a clicking sound.



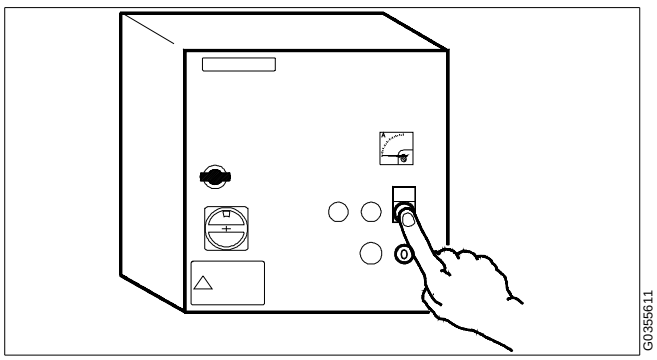
8. Let the belt stay in this position for at last 30 minutes **without** starting the separator. Then repeat steps 1-4 and 6-7 above.



NOTE

The separator must not be started until the retightening after 30 minutes has been made. If starting, the belt may slip and be damaged. A slipping belt can also damage the water tank.

9. The separator may now be started.



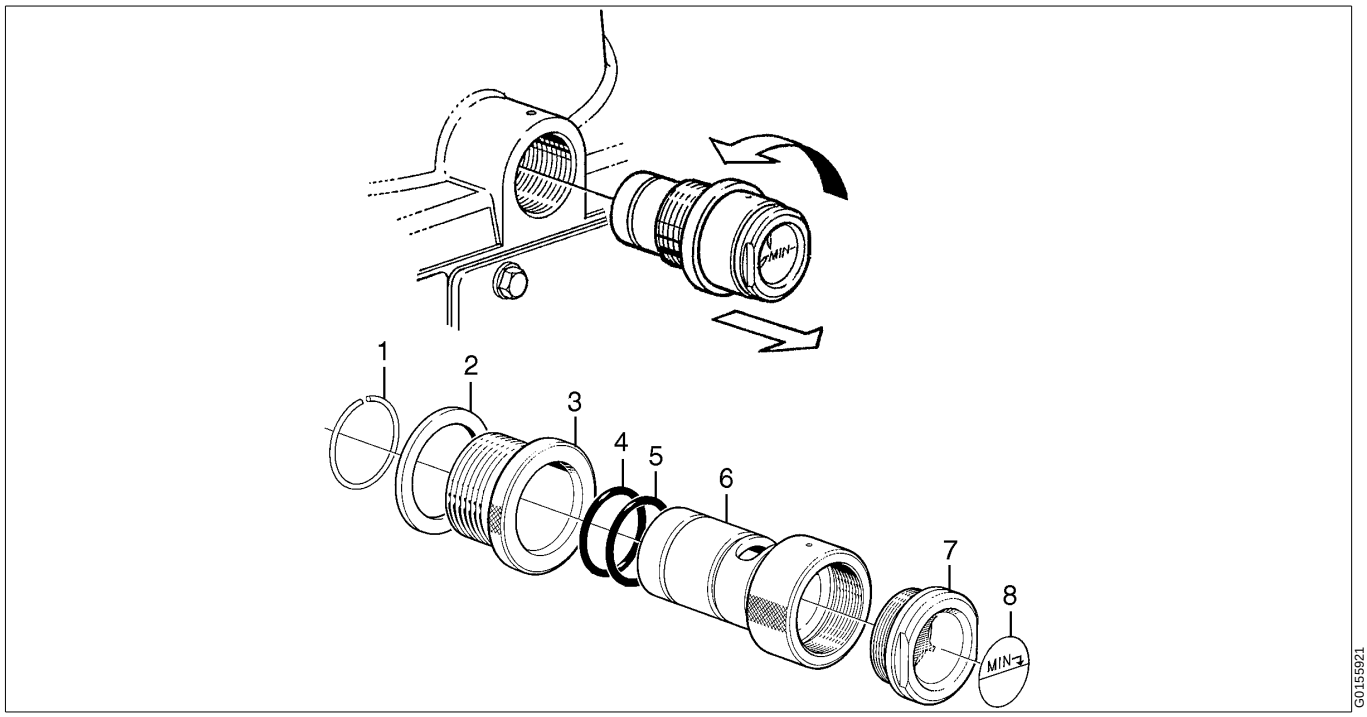
NOTE

The belt must be retightened when the separator has been in operation approximately 24 hours after the belt change.

Repeat steps 1 to 7.

6.6 Oil filling device

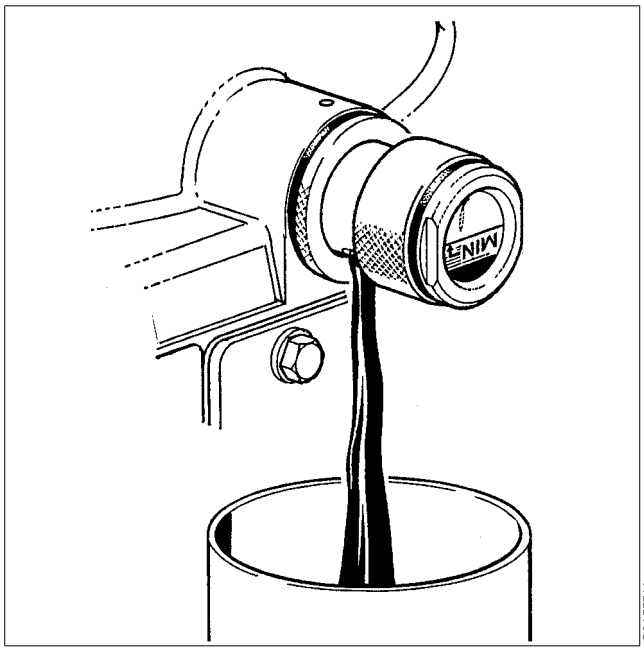
6.6.1 Exploded views



1. *Round safety wire*
2. *Sealing ring*
3. *Nipple*
4. *O-ring*
5. *O-ring*
6. *Sleeve for oil filling*
7. *Oil glass*
8. *Plate*

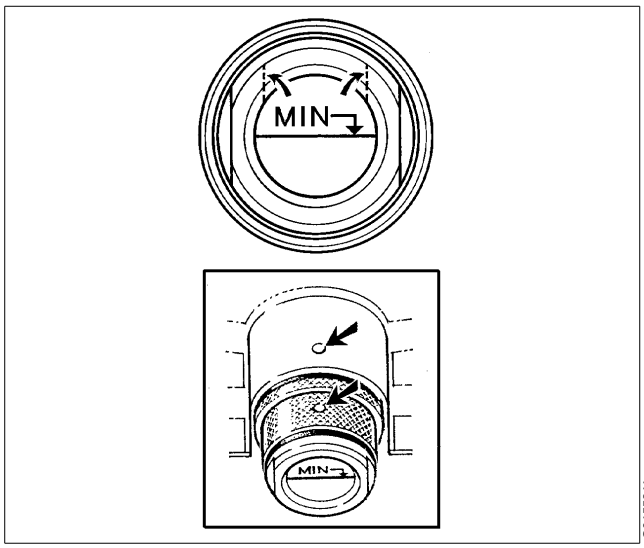
6.6.2 Dismantling

1. Drain off the oil, see “5.7.1 Oil change procedure” on page 84.
2. Unscrew nipple and pull off the oil filling device. Then unbend the round safety wire and pull off the nipple.



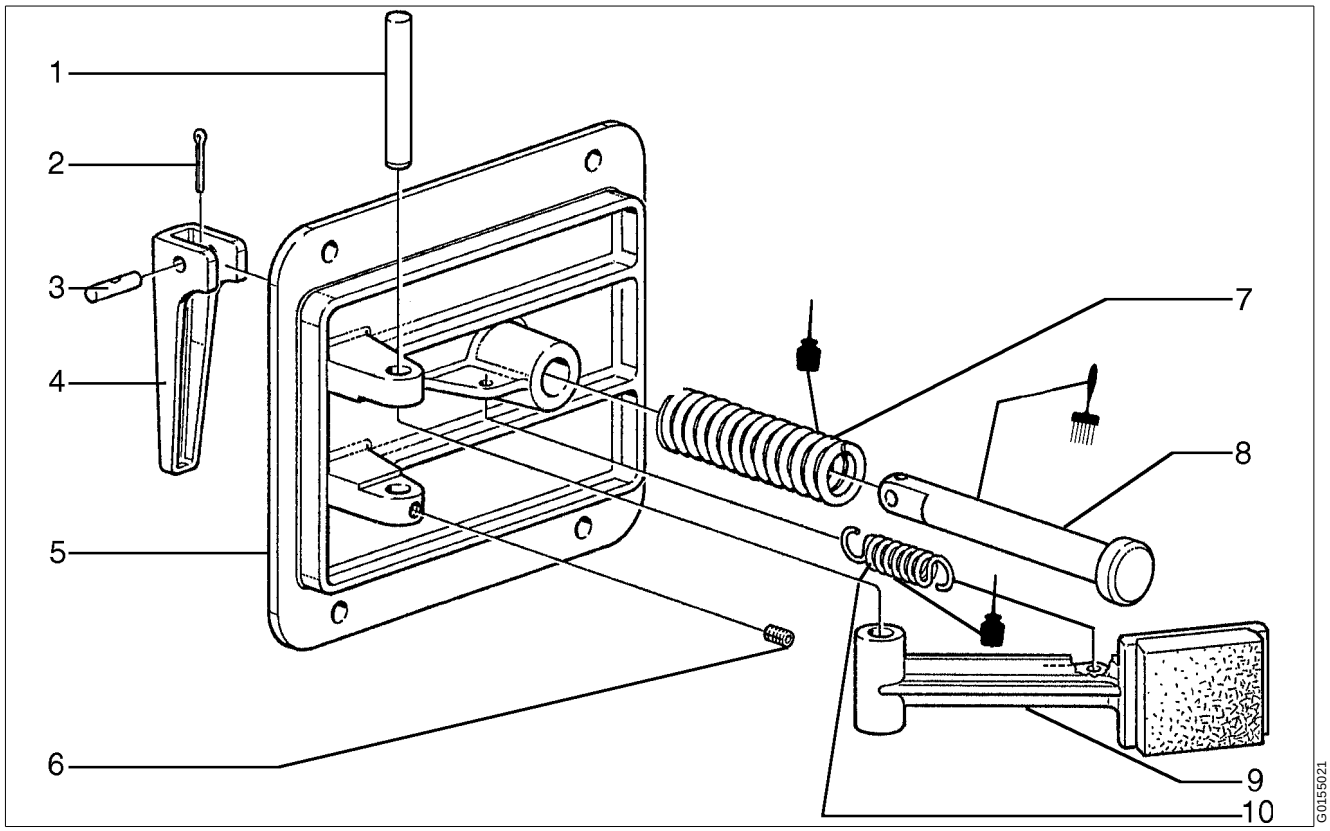
6.6.3 Assembly

1. If plate is to be replaced, wipe the sightglass with a degreasing agent and fit the new plate (self-adhesive) on the outside of the sightglass. Mark its position relative to the recess in sleeve.
2. Lubricate the O-rings with silicone grease.
3. Assemble the device and fit it in the frame. Note that the mark on sleeve must be positioned opposite the mark on the frame.
4. Fill the sump with new oil, “5.7.1 Oil change procedure” on page 84.



6.7 Brake

6.7.1 Exploded view



1. *Cylindrical pin*
2. *Split pin*
3. *Cylindrical pin with hole*
4. *Handle*
5. *Cover*
6. *Set screw*
7. *Compression spring*
8. *Shaft*
9. *Arm, complete, with friction element*
10. *Tension spring*

Oil

Alfa Laval lubricating paste or Molykote 1000 Paste

6.7.2 Dismantling/Assembly

✔ **Check point**
“5.4.4 Brake” on page 67.

6.8 Frame feet

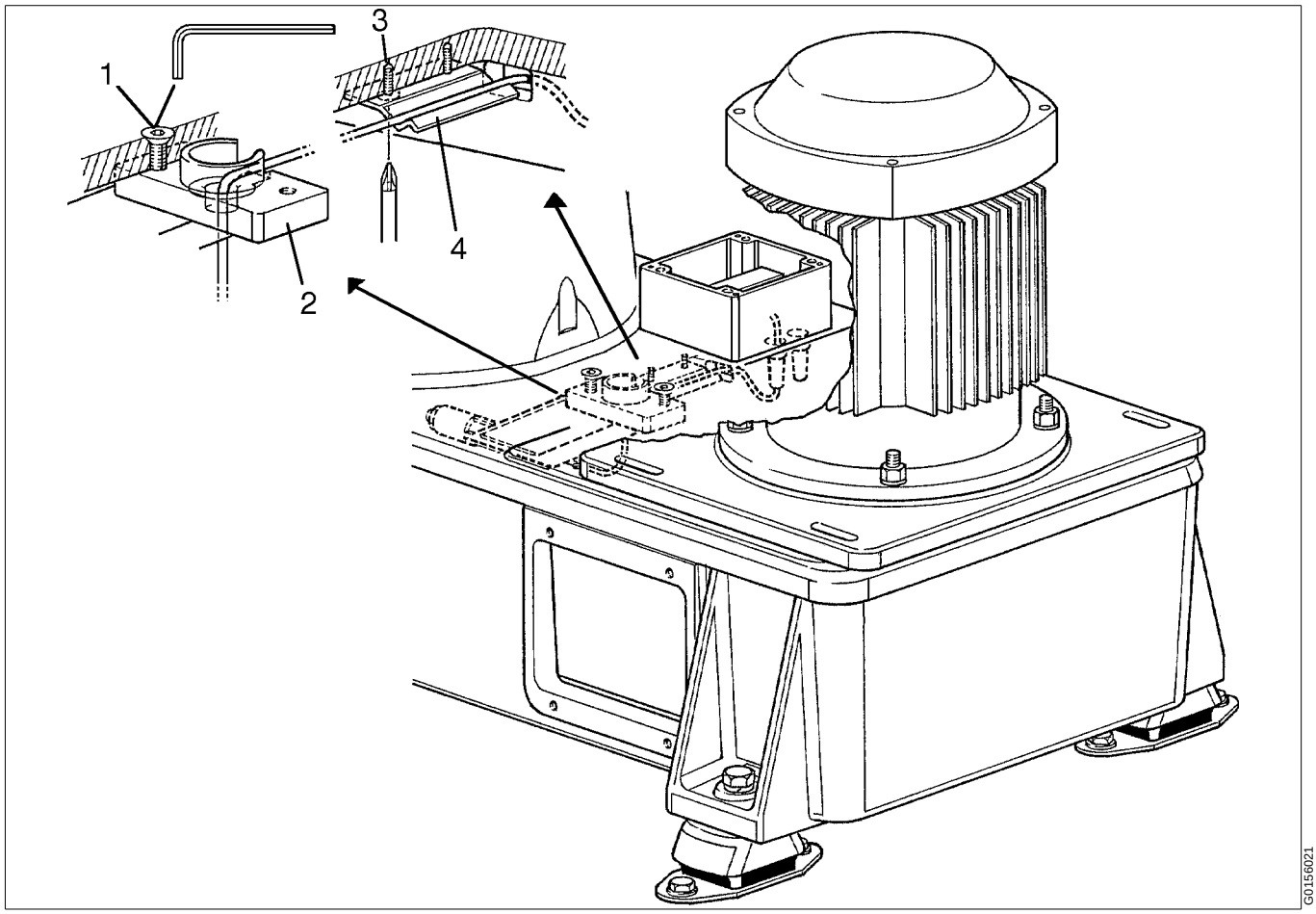
6.8.1 Mounting of new frame feet

When replacing the frame feet, the separator must be lifted. Follow “5.5 Lifting” on page 77.

1. Remove the bowl from the separator.
2. Loosen the foundation bolts and lift the separator.
3. Remove the existing frame feet.
4. Mount the new feet.
5. Place the separator in its original position and fasten the foundation bolts.
6. Assemble the separator bowl, see “6.2.3 Assembly” on page 110.

6.9 Speed sensor and junction box (option)

6.9.1 Exploded view



1. *Countersunk cap head screw*
2. *Speed sensor holder*
3. *Cross-headed screws*
4. *Cable holder*

6.9.2 Mounting

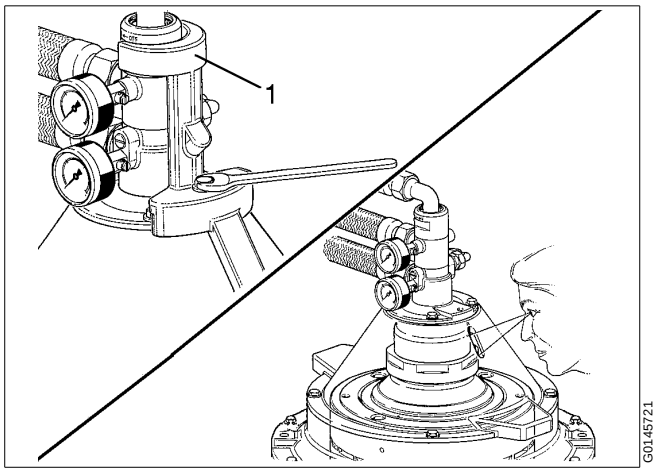
DANGER

Entrapment hazards

Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

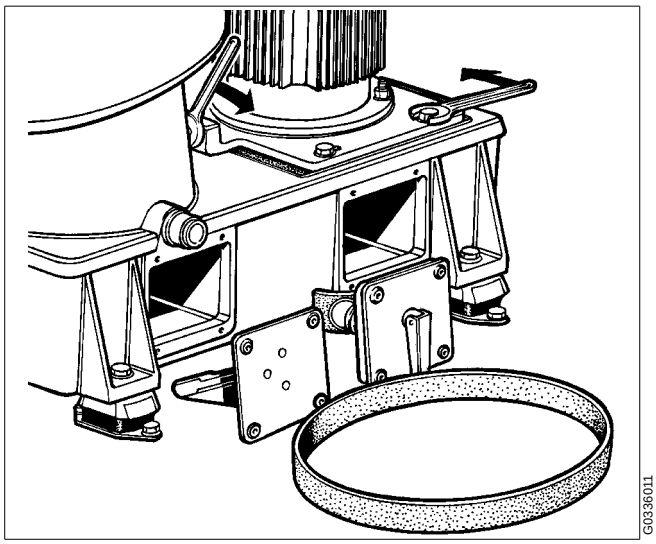
Remove safety device (1) and look through the slot in the frame hood to see if the bowl still rotates.

To avoid accidental start, switch off and lock power supply before starting any dismantling work.



1. Remove the two covers from the frame bottom part.
2. Screw back the belt tightener as far as possible from the frame and then remove the motor adapter screws.

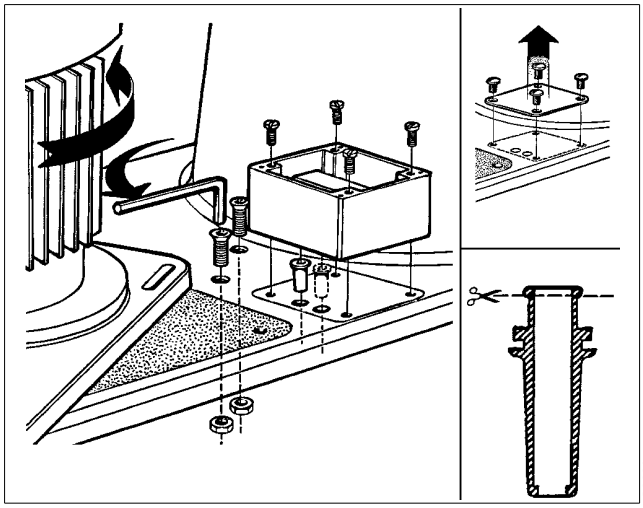
   Remove the flat belt.



3. *Only first time installation:* Turn and pull back the electric motor in order to uncover two countersunk cap head screws.

   Remove the two screws with nuts. Discard the nuts.

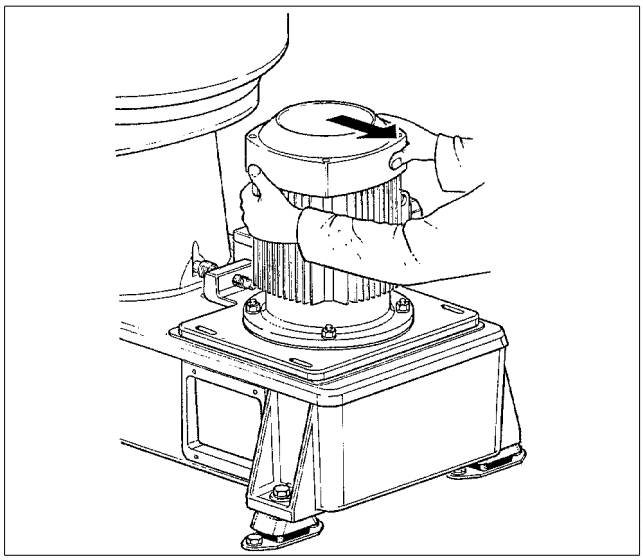
4. *Only first time installation:* Remove the plate covering the cable holes, cut and fit the bending protections as in the illustration. Mount the junction box.



NOTE

One of the bending protections is for the optional unbalance sensor.

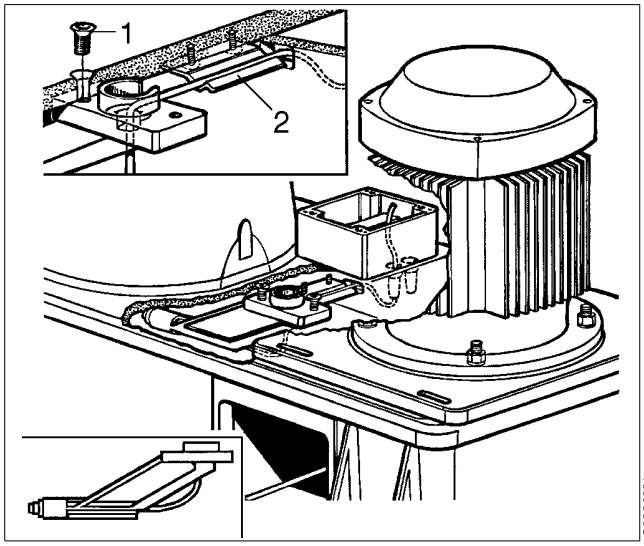
5. *Replacement of existing sensor:* Push the motor together with its adapter backwards to uncover the two screws holding the complete speed sensor.
6. *Replacement of existing sensor:* Disconnect the cables in the junction box.
7. *Replacement of existing sensor:* Loosen the two screws holding cable holder a maximum of two turns to facilitate removal and fitting of the cable.
8. *Replacement of existing sensor:* Remove the two screws holding the complete speed sensor.



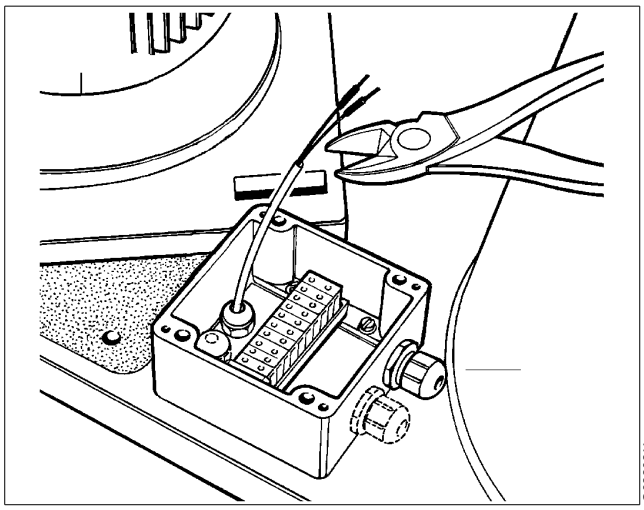
Push the motor backwards

9. Fit the speed sensor on the inside of the frame bottom part. Secure it with the two countersunk cap head screws (1).
10. Put the cable onto the cable holder (2), then through the web and in to the junction box through the inner cable bush.
11. Make sure that the speed sensor is correctly positioned.

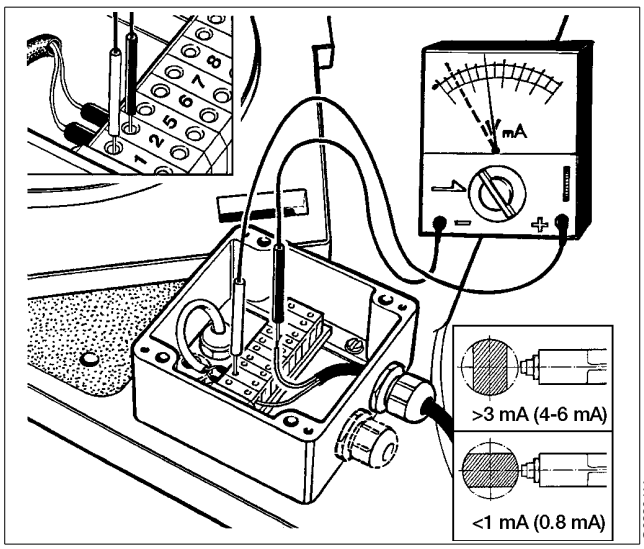
✔ **Check point**
"5.4.16 Speed sensor (option)" on page 76.



12. Thread the cable gland onto the cable and secure the gland using a socket wrench.
13. Cut the cables about 110 mm from the cable gland and fit cable clips. Mark and connect the cables:
    - Blue cable marked 1 to terminal 1.
    - Brown cable marked 2 to terminal 2.
14. If new installation, connect the cable terminals to the corresponding terminals in the separator control unit. See the System Manual.



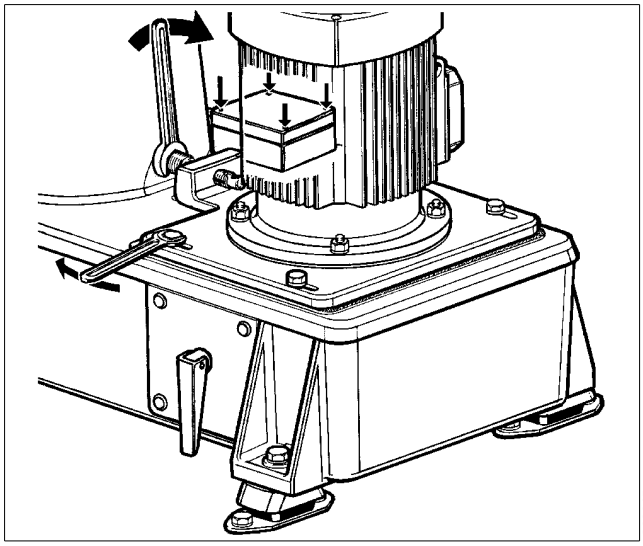
15. With the separator control unit turned on:
    a. Measure the voltage across terminals 1 (-) and 2 (+) in the junction box. There should be a voltage of about 8 V DC.
    b. Disconnect the cable to the control equipment at terminal 2. Connect a mA-meter in series, i.e. (-) to terminal 2 and (+) to the cable end and measure the current.
        - With the sensor in position "Far" the current should be above 3 mA (typically 4 - 6 mA).
        - With the sensor in position "Near" the current should be less than 1 mA (typically 0,8 mA).



16. Fit the cover on the junction box.
17. Fit and tighten the flat belt, see chapter “6.5 Flat belt” on page 149.

NOTE

It is important to follow the flat belt tightening procedure described in chapter “6.5 Flat belt” on page 149.



6.10 Unbalance sensor and junction box (option)

6.10.1 Mounting

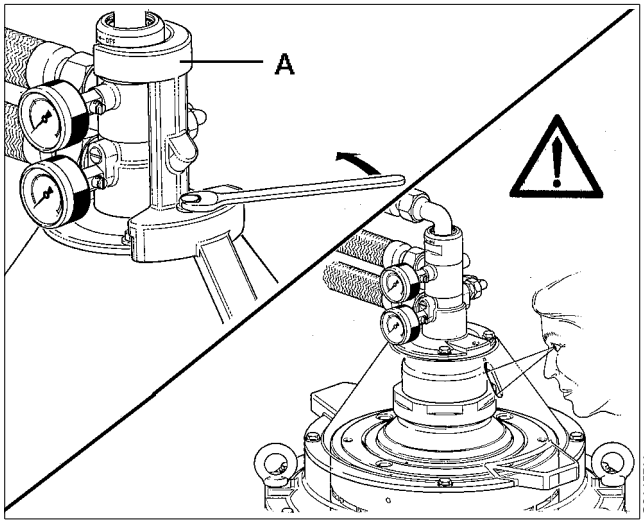
DANGER

Entrapment hazards

Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

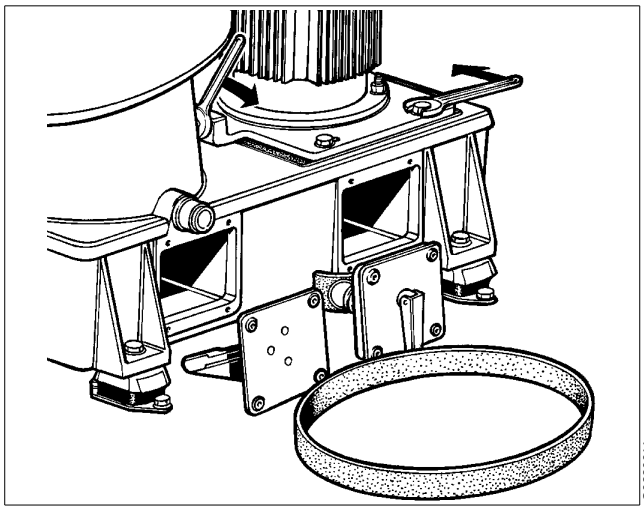
Remove safety device (1) and look through the slot in the frame hood to see if the bowl still rotates.

To avoid accidental start, switch off and lock power supply before starting any dismantling work.



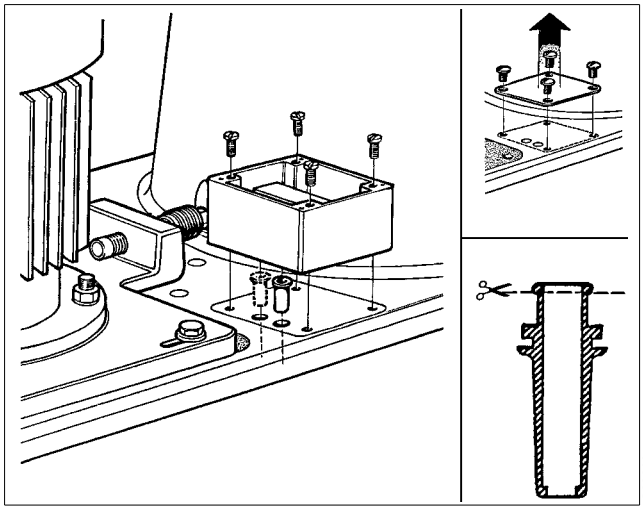
1. *Only first time installation:* Remove the two covers from the frame lower part.
2. *Only first time installation:* Screw back the belt tightener as far as possible from the frame and then the motor adapter screws.

   Remove the flat belt.



3. *Only first time installation:* Remove the plate covering the cable holes, cut and fit the bending protections as in the illustration.

   Mount the junction box.



NOTE

One of the rubber bushings is for the optional speed sensor.

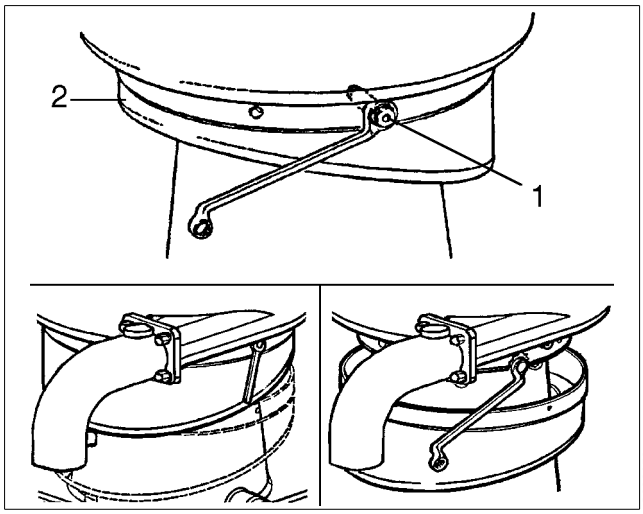
4. Remove the nipple (1) of the operating water inlet.
5. Remove the three screws from the collecting ring (2) and lower ring.

   First time installation:

   Remove the plastic plug from the screw plug where the sensor is to be mounted. Then remove the screw plug by using a 24 mm cap key.

   Replacement of existing sensor:

   Unscrew and remove the unbalance sensor by using a 24 mm cap key.

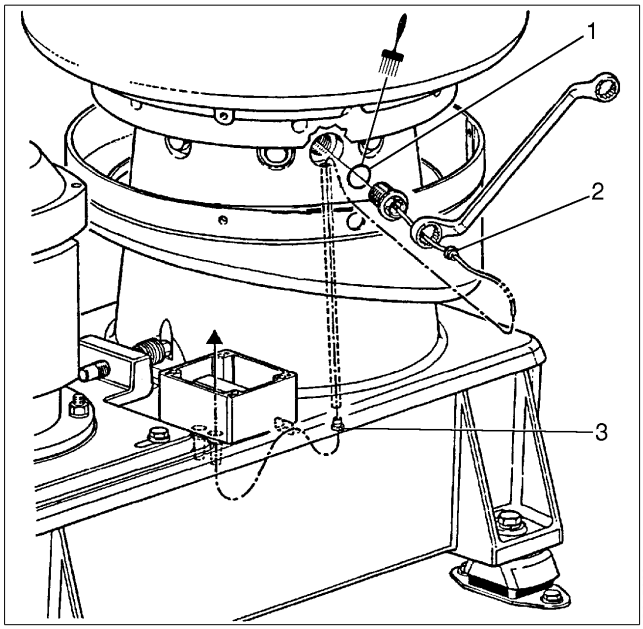


6. Lubricate the threads of the sensor. See chapter “8.5.4 Recommended lubricants” on page 193. Make sure to fit the O-ring (1).

   Fit and tighten the unbalance sensor.

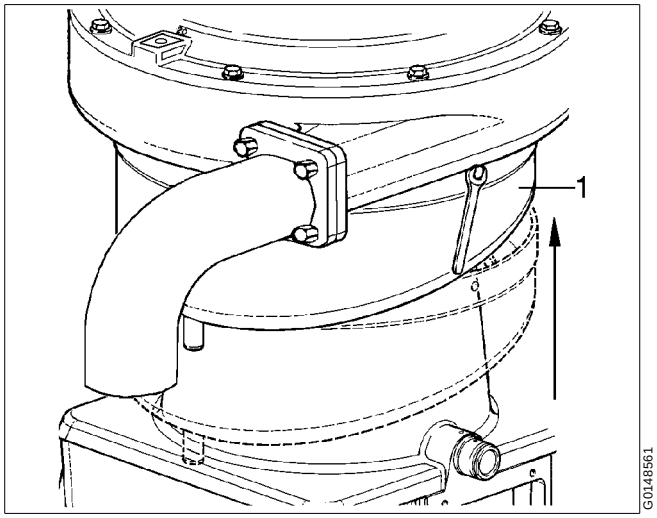
7. Slip the upper lead-through bushing (2) onto the cable and pull the cable through the protecting tube in the frame. Fit the lower lead-through bushing (3) and pull the cable through the web and into the junction box outer bush.

   Put the lead-through bushings in place.

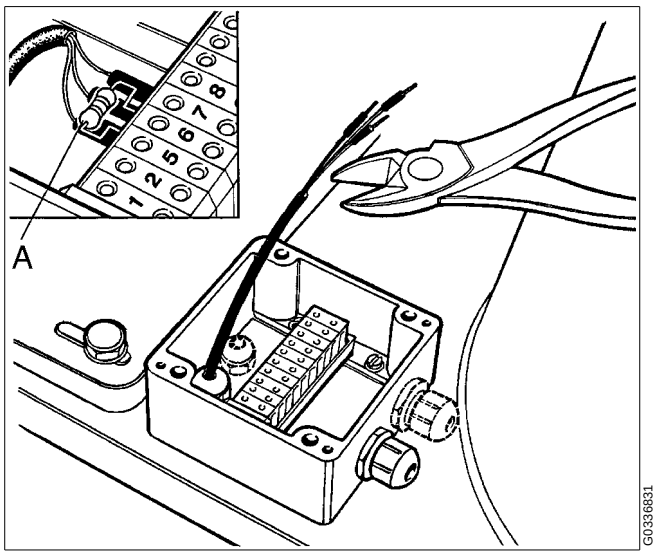


8. Lift up the collecting ring (1) and tighten the three screws.

   Fit the operating water nipple.



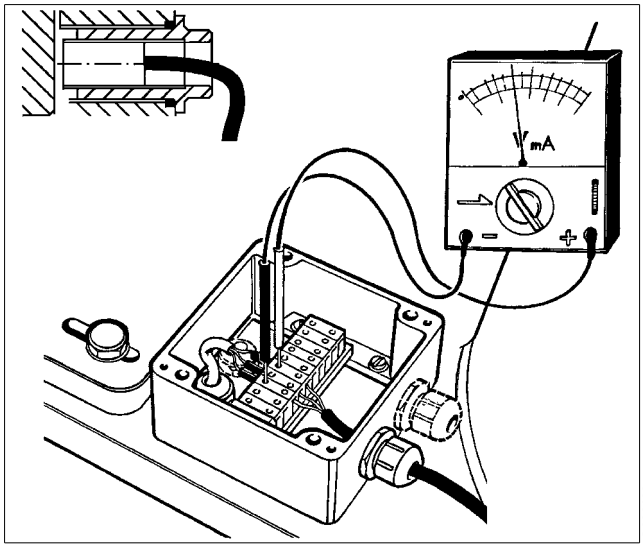
9. Thread the cable gland onto the cable and secure the gland using a socket wrench.
10. Cut the cables about 110 mm from the cable gland and fit cable clips. Mark and connect the cables:
    - Blue cable marked 5 to terminal 5
    - Black cable marked 6 to terminal 6
    - Brown cable marked 7 to terminal 7
11. Connect a 470 Ohm (1/4 W) resistor (A) between terminals 5 and 6.



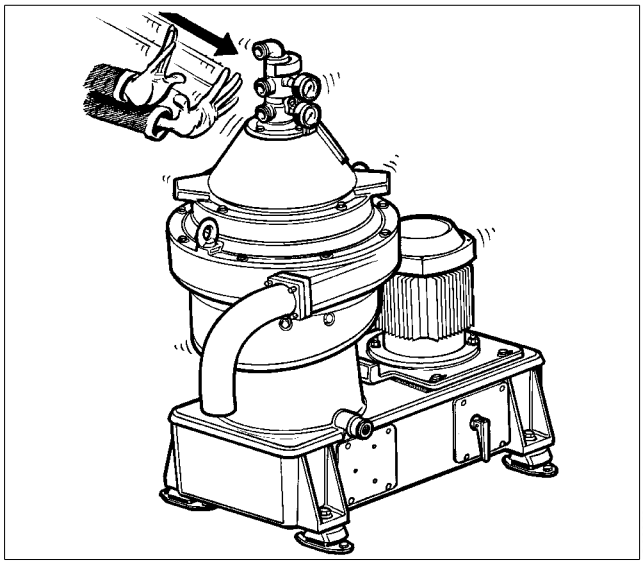
12. *Only first time installation:* Connect the terminals to corresponding terminals in the separator control unit.

13. With the separator control unit turned on, first measure the supply voltage. There should be 24V DC across the terminals 5 (-) and 7 (+).

14. Measure the output voltage with the volt meter connected to terminal 5 (-) and to terminal 6 (+) in the junction box. The voltage should normally be 5 ± 0,2 V corresponding to a distance of 3,5 mm between the bowl spindle assembly and the sensor.



15. Shake the separator from side to side to ensure that the unbalance alarm function is active.

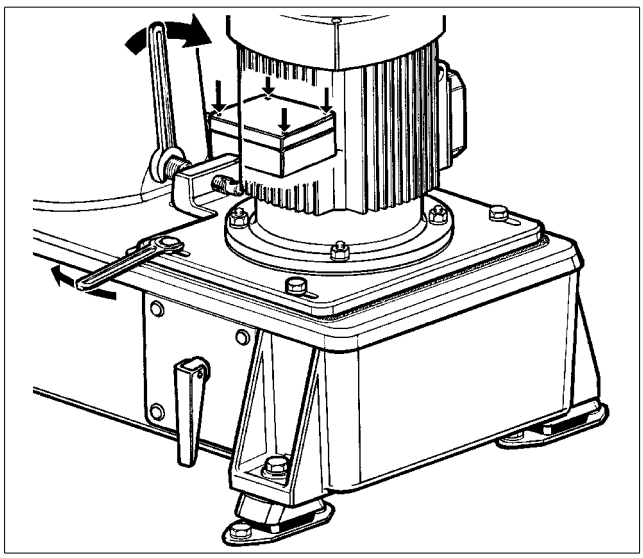


NOTE

If the output voltage deviates from the above values owing to an incorrect distance between the bowl spindle assembly and the sensor, renew the unbalance sensor or contact an Alfa Laval representative.

16. Fit the cover onto the junction box.

17. *Only first time installation:* Fit and tighten the flat belt, see chapter “6.5 Flat belt” on page 149.

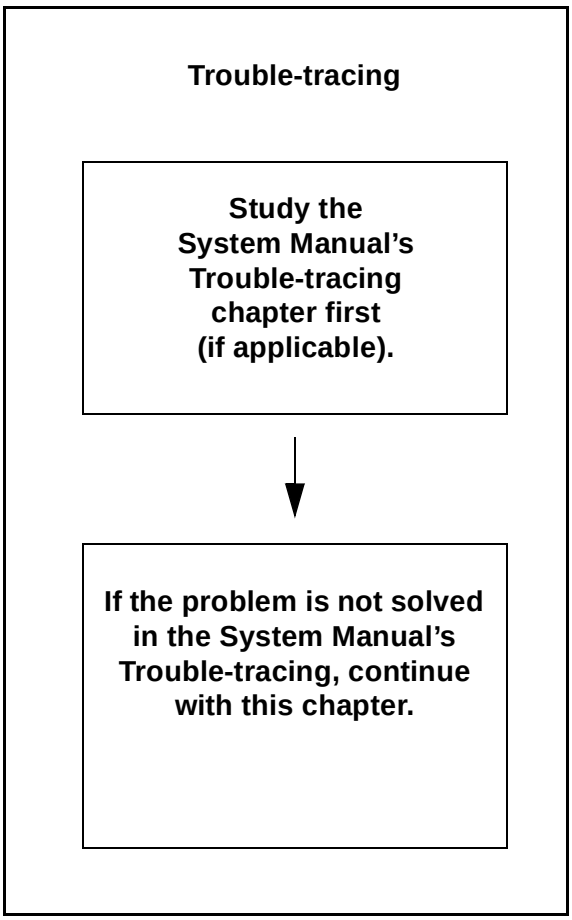


NOTE

It is important to follow the flat belt tightening procedure described in chapter “6.5 Flat belt” on page 149.

7 Trouble-tracing

Contents



7.1 MFPX mechanical functions

7.1.1 Separator vibrates

NOTE

Some vibration is normal during the starting and stopping sequences when the separator passes through its critical speed.

DANGER

Disintegration hazards

If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.

The cause of the vibration must be identified and corrected before the separator is restarted. Excessive vibration may be due to incorrect assembly or poor cleaning of the bowl.

Cause	Corrective actions	Page
Bowl out of balance due to: - poor cleaning - incorrect assembly - incorrect disc stack compression - bowl assembled with parts from other separators	Dismantle the separator and check the assembly and cleaning.	110
Uneven sludge deposits in the sludge space.	Dismantle and clean the separator bowl.	100
Height position of paring disc is incorrect.	Stop the separator, measure and if necessary adjust the height.	72
Bowl spindle bent (max 0,04 mm).	Renew the bowl spindle.	66
Bearing(s) is damaged or worn.	Renew all bearings.	123, 139
The frame feet are worn out.	Renew the frame feet.	158
Spindle top bearing spring broken.	Renew all springs.	123

7.1.2 Smell

Cause	Corrective actions	Page
Normal occurrence during start while the friction blocks are slipping.	None.	—
Brake is applied.	Release the brake.	—
Oil level in oil sump too low.	Check oil level and add oil if necessary.	32

7.1.3 Noise

Cause	Corrective actions	Page
Height position of paring disc is incorrect.	Stop the separator, measure and adjust the height.	72
Bearing(s) damaged or worn.	Renew all bearings.	123, 139
Incorrect play between brake friction elements and belt pulley.	Adjust the play.	67
Flat belt is slipping.	Tighten the flat belt.	149

7.1.4 Speed too low

Cause	Corrective actions	Page
Brake is applied.	Release the brake.	—
Friction pads are oily or worn.	Clean or renew friction pads.	70, 139
Bowl is not closed or leaking.	Dismantle the bowl and check.	100
Motor failure.	Repair the motor.	—
Bearing(s) damaged.	Renew all bearings.	123, 139
Flat belt is slipping.	Tighten the flat belt.	152
Incorrect transmission parts (60 Hz belt pulley for 50 Hz power supply).	 **DANGER** Stop and change the belt transmission to suit the power supply frequency.	139, 149

7.1.5 Speed too high

Cause	Corrective actions	Page
Incorrect transmission parts (50 Hz belt pulley for 60 Hz power supply).	 **DANGER** Stop and change the belt transmission to suit the power supply frequency.	139, 149

7.1.6 Starting power too high

Cause	Corrective actions	Page
Incorrect transmission parts (60 Hz belt pulley for 50 Hz power supply).	 **DANGER** Stop and change the belt transmission to suit the power supply frequency.	139, 149
Wrong direction of rotation.	Change electrical phase connections to the motor.	—

7.1.7 Starting power too low

Cause	Corrective actions	Page
Incorrect transmission parts (50 Hz belt pulley for 60 Hz power supply).	 **DANGER** Stop and change the belt transmission to suit the power supply frequency.	139, 149
Flat belt slipping.	Tighten the flat belt.	152
Friction pads are oily or worn.	Clean or renew friction pads.	70, 139
Motor failure.	Repair the motor.	—

7.1.8 Starting time too long

Cause	Corrective actions	Page
Brake is applied.	Release the brake.	—
Friction pads are oily or worn.	Renew or clean friction pads.	70, 139
Height position of paring disc is incorrect.	Stop, check and adjust the height.	72
Motor failure.	Repair the motor.	—
Bearing(s) damaged or worn.	Renew all bearings.	123, 139

7.1.9 Retardation time too long

Cause	Corrective actions	Page
Brake friction element is worn or oily.	Renew or clean brake friction brake elements.	70, 139

7.2 MFPX separating functions

7.2.1 Liquid flows through the bowl casing drain and/or sludge outlet

Cause	Corrective actions	Page
Sludge discharge or water draining in progress.	None (normal).	—
Strainer in operating water line is clogged or water pressure is too low.	Clean the strainer and check water flows: Displacement/conditioning water 1,3 l/min. Opening water 16 l/min. Closing water 8 l/min.	—
Channels in operating device are clogged.	Clean the operating device.	96
O-ring at the flow control disc defective.	Renew the O-ring.	96
Paring chamber defective.	Renew the paring chamber.	96
Seal ring in the bowl hood defective.	Renew the seal ring.	96
Sealing edge of the sliding bowl bottom defective.	Smoothen sealing edge of the sliding bowl bottom or renew it.	64
Valve plugs are defective.	Renew all valve plugs.	64
Bowl speed too low.	See section “7.1.4 Speed too low” on page 171.	—

7.2.2 Bowl opens accidentally during operation

Cause	Corrective actions	Page
Strainer in the operating water supply is clogged.	Clean the strainer.	—
No water in the operating water system.	Check the operating water system and make sure the valve(s) are open.	—
Hoses between the supply valves and separator are incorrectly fitted.	Correct.	—
Nozzles in bowl body clogged	Clean the nozzles.	62
Square-sectioned ring in sliding bowl bottom is defective.	Renew the square-sectioned ring.	96
Valve plugs are defective.	Renew all plugs.	75, 96
Supply valve for opening water is leaking.	Rectify the leak.	—

7.2.3 Bowl fails to open for sludge discharge

Cause	Corrective actions	Page
Strainer in the operating water supply is clogged.	Clean the strainer.	—
Water flow too low.	Check the opening water flow; 16 l/min.	—
Hoses between the supply valves and separator are incorrectly fitted.	Correct.	—
Nozzles in bowl body clogged.	Clean the nozzles.	62
Seal ring in the operating slide is defective.	Renew the seal ring.	96

7.2.4 Unsatisfactory sludge discharge

Cause	Corrective actions	Page
Valve plugs in the operating slide too high.	Renew with correct valve plugs.	64
Sludge deposits in the operating system.	Check and clean the operating system.	96
Too long discharge interval.	Reduce the time between sludge discharges.	—

7.2.5 Unsatisfactory separation result

Cause	Corrective actions	Page
Incorrect separation temperature.	Adjust.	—
Throughput too high.	Adjust.	—
Disc stack is clogged.	Clean disc stack.	79, 96
Sludge space in bowl is filled.	Clean and reduce the time between sludge discharges.	79, 96
Bowl speed too low.	Examine the motor and power transmission including the gear ratio.	139, 149, 178
Bowl rotates i wrong direction	Check the electrical connections to the motor.	—

7.2.6 High pressure in water outlet

Cause	Corrective actions	Page
Throughput too high.	Adjust.	—
Valve(s) in oil outlet line closed.	Open the valve(s).	—
Separation temperature too low.	Adjust.	—
Bowl disc stack is clogged.	Clean disc stack.	96
Bowl is incorrectly assembled.	Check assembly.	96
Oil paring disc is defective.	Renew the oil paring disc.	96

8 Technical Reference

Contents

8.1 Technical data

NOTE

The separator is a component operating in an integrated system including a monitoring system. If the technical data in the system description does not agree with the technical data in this instruction manual, the data in the system description is the valid one.

Product number	881139-01-06
Separator type	MFPX 307TFD-21
Application	Cleaning of heavy fuel oil with densities up to 1010 kg/m^3 at 15 °C for marine and power applications. The flash point of the fuel oil to be separated must be min. 60 °C.

Alfa Laval ref. 554056, rev. 4

Bowl Speed max.	8375/8400	rev/min, 50Hz/60Hz
Speed motor shaft max.	3000/3600	rev/min, 50Hz/60Hz
Gear ratio	134:48/112:48	50 Hz/60Hz
Hydraulic capacity	10,5	m³/h
Max. process capacity	6,5	m³/h
Max. heavy phase capacity	0,315	m³/h
Nom. discharge volume	1,8 - 2,4.	litres fixed discharge volume
Min. discharge interval	1,0	minutes
Min. ratio of density	0,890	(light phase/heavy phase)
Max. ratio of density	0,999	(light phase/heavy phase)
Max. density of feed/sediment	1100/1984	kg/m³
Feed temperature	0/100	min. / max. °C
Max. density of operating liquid	1000	kg/m³
Max. pressure operating liquid	600	kPa
Weight of separator	603	kg (without motor)
Motor power	7,5	kW
Max. power consumption	10,3	kW (at starting up)
Power consumption	2,7/7,0	kW(idling/max. proc. cap.)
Lubricating oil volume	2,0	litres
Starting time	4,5/5,0	minutes (min. / max.)
Stopping time with brake	5,0/12,5	minutes (min. / max.)
Stopping time without brake	40	minutes (average)
Max. running time,		
– empty bowl	300	minutes
– filled bowl	300	minutes

Sound power/sound press. level	9,8/82	Bel(A) /dB(A)
Vibration level max.	5,6/9,0	mm/sec (new sep./sep. in use)
Bowl max. inner diameter	317	mm
Bowl volume	6,2	litres
Bowl weight	134	kg
Bowl body material	AL 111 2377-02	
There are other material than stainless steel in contact with process fluid.		

8.2 Connection list

Alfa Laval ref. 553809 rev. 5

Connection No.	Description	Requirements/limit
201	Inlet for process liquid. - Allowed temperature - Max. pressure	 Min. 0 °C, max. 100 °C 600 kPa
206	Inlet for conditioning and displacement liquid - Instantaneous flow - Pressure	Fresh water 1,3 litres/minute 200-600 kPa
220	Outlet for light phase (oil) - Counter pressure	 0-350 kPa
221	Outlet for heavy phase (water) - Counter pressure	 0-600 kPa
222	Outlet for solid phase	The outlet after the separator should be installed in such a way that you can not fill the frame top part with sludge. (Guidance of sludge pump or open outlet)
375	Operating liquid - Quality requirements - Opening water: - Flow - Time - Closing water: - Flow (after discharge) - Time (after discharge) - Time (at start-up) - Opening and closing periods to be connected without interuption - Temperature - Pressure - Consumption at start up - Consumption	 See “8.4 Water quality” on page 187 16 ±3,2 litres/minute 1 second 8 ±1,6 litres/minute 5 seconds 15 seconds Max. 80°C 200-600 kPa 2,1 litres 0,8 litre/discharge
462	Drain of frame top part, lower	

Connection No.	Description	Requirements/limit
701	Motor for separator - Max deviation from nominal frequency - Momentarily during maximum 5 seconds	 ±5% ±10%
740	Speed sensor for bowl spindle (delivered as option), see “8.3 Interface description” on page 182 - Type - Supply voltage, nominal - With sensor activated (near metal) - With sensor not activated (far from metal) - Number of pulses per revolution	 Inductive proximity switch 8 V Less than 1 mA Greater than 3 mA 2
752	Position transducer (unbalance sensor) for bearing holder (delivered as option), see “8.3 Interface description” on page 182 - Type - Supply voltage - Operation range (mild steel) - Output voltage within sensing range - Load resistance, R_L	 Inductive analogue sensor 15 to 30 V DC 2 to 5 mm 1 to 9 V DC 470 Ohm

8.3 Interface description

Alfa Laval ref. 556243 rev. 4

8.3.1 General

In addition to the Connection List this document describes limitations and conditions for safe control, monitoring and reliable operation.

At the end of the document a function graph and running limitations are found.

8.3.2 Definitions

Stand still (Ready for start) means:

- The machine is assembled correctly.
- All connections are installed according to Connection List, Interconnection Diagram and Interface Description.

Start means:

- The power to the separator is on.
- The acceleration is supervised to ensure that a certain speed has been reached within a certain time.

Normal stop means:

- Stopping of the machine at any time with brake applied.
- The bowl must be kept filled.

Safety stop means:

The machine must be stopped in the quickest and safest way due to vibrations or process reasons.

Comply to following conditions:

- The bowl must be kept filled.
- Sludge ejection must not be made.
- The machine must not be restarted before the reason for the safety stop has been investigated and action has been taken.

In case of emergency condition in the plant, the machine must be stopped in a way that is described in EN418.

8.3.3 Component description and Signal processing

Separator motor 701

The separator is equipped with a 3-phase DOL- (direct on line) started motor. The separator can also be started by a Y/D starter, but then time in Y-position must be maximized to 5 seconds.

Speed sensor 740 (option)

The separator is equipped with a proximity sensor mounted at the lower end of the bowl spindle. The spindle is equipped with a number of grooves giving a number of impulses per revolution.

The sensor is of inductive type according to the DIN 19234 (NAMUR) standard. When supplied with a rated voltage it gives a current signal with a size depending of the position of the sensor head is near the shaft (metal) surface or above the groove (non-metal).

When the sensor is connected to certified switching devices, it may be used for Ex-applications.

Speed signal during start

An alarm must be given and the machine must be stopped if 95% of the synchronous speed has not been achieved within 5 minutes.

Speed signal during normal operation

Normal operation condition is considered to have been achieved 1 minute after 95% of synchronous speed has been reached. (The 1 minute waiting time is for the operating water system to obtain stable conditions.)

During normal operation the speed is allowed to vary within the speed limits specified below:

- When the synchronous speed is exceeded with more than 5%, the machine must be stopped and an alarm must be given.
- When the speed falls below 7% of the synchronous speed for a longer period than 1 minute, a low speed alarm signal must be given.

Unbalance sensor 752 (option)

For indication of any abnormal unbalance in order to perform appropriate countermeasures, the separator has been equipped with a sensor monitoring the radial position of the upper bearing holder.

The analog inductive sensor gives a current output corresponding to the distance between the upper bearing holder and the sensor.
In the junction box there is a resistor connected across the current output which gives a voltage signal to the control system.
The output voltage is direct proportional to the radial position of the spindle. In normal conditions, i.e. the spindle in centre position, the output voltage should be 5 volt corresponding to a distance of 3,5 mm.

Unbalance signal

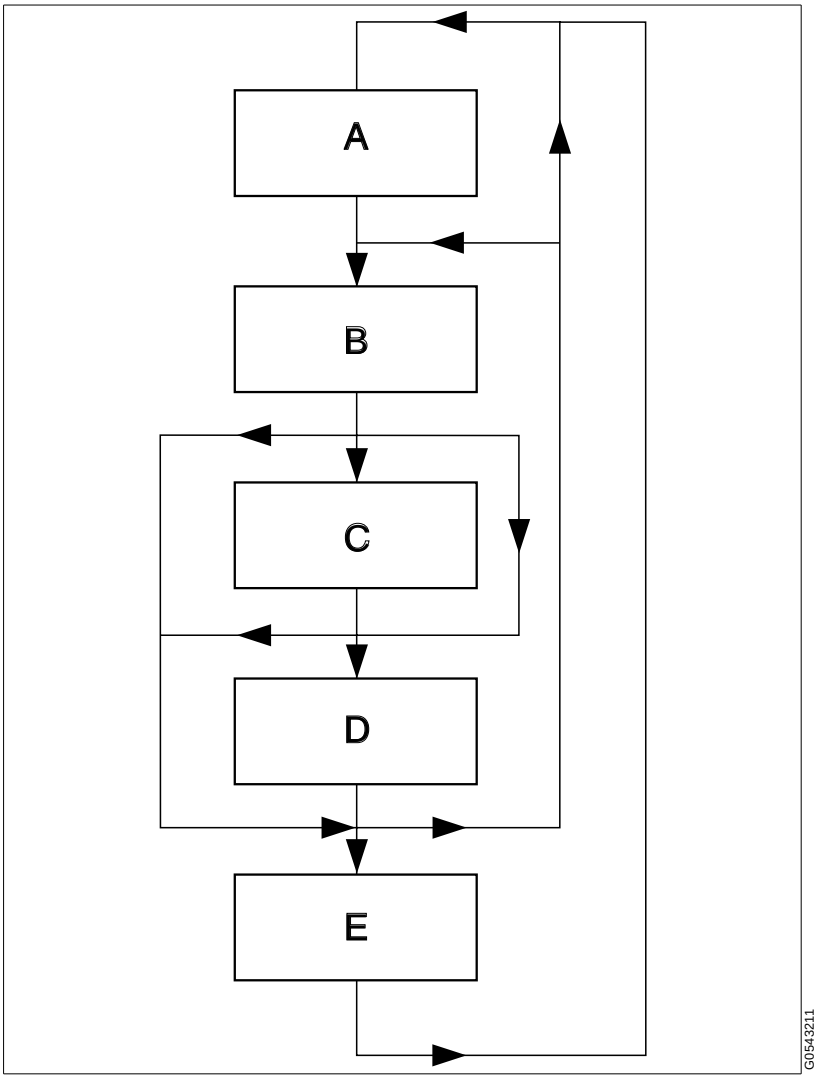
- When the unbalance signal amplitude (peak to peak) exceeds a value of one volt corresponding an unbalance (peak to peak) of 0,3 mm, a warning alarm should be given and the machine should be stopped manually in order to investigate the reason for the unbalance.
- When the unbalance signal amplitude (peak to peak) exceeds a value of two volt, corresponding an unbalance amplitude (peak to peak) of 0,6 mm, the following actions must be taken:
  - Immediate safety stop of the machine including alarm for extreme unbalance.
  - Blocking of the discharge system (discharge must not be performed).
  - Keeping the bowl filled.
  - When the output signal level exceeds 10 volt a sensor failure alarm should be given.

Junction box

The two sensors are connected to a common junction box from where the signals could be taken to secondary devices, see‘‘8.6.5 Interconnection diagram” on page 202.

In order to make sure that the prescribed minimum resistive load is maintained for the unbalance sensor independent of the type of connected electronic device, a resistor has been placed across the terminals for the sensor signal in the junction box.

8.3.4 Function graph and running limitations



A. Stand still (Ready for start)
B. Starting mode
C. Running mode
D. Stop mode
E. Safety stop mode

8.4 Water quality

Alfa Laval ref. 553406

General

Specific requirements regarding the purity of water are necessary.

- Deposits must not be allowed to form inside the separator.

- Erosion and corrosion of the PX mechanism must also be prevented.

The four requirements below are of fundamental importance. For test methods, contact an Alfa Laval representative. If these demands cannot be met, the water should be pre-treated in accordance with Alfa Laval's recommendations.

Alfa Laval accepts no liability for consequences arising from unsatisfactory purified operating water supplied by the customer.

Suspended particles

Content of suspend substances: Less than 0,001 volume percent.

Turbidity-free water, solids content < 0,001 percentage of volume. Due to the centrifugal force, any suspended particles present in the water will separate out in the operating mechanism, causing the valves to clog and the system to break down. A mere 0,001 percentage of volume solids content in the operating water produces 10 ml of precipitate in two days when using as little as 20 lit/h of operating water.

Max particle size: 50µm.

Total hardness

Less than 10° dH (180 mg $CaCO_3$/litre).

If the water is hard (i.e. 10° dH or 12,5° E), in time chalk deposits build up around the operating mechanism including the valves. The build-up of deposits accelerates with increased operating temperature and low discharge frequency.

The harder the water is, the more severe these effects become.

Chloride content

Less than 100 ppm NaCl (60 mg Cl/litre).

Chloride ions contribute to corrosion on the separator surfaces in contact with the operating water, including the spindle. Corrosion is a destructive process that is accelerated by increased separating temperature, low discharge frequency, low pH and high chloride ion concentration. A chloride concentration above 60 mg/litre is definitely not recommended.

pH value

pH > 6

Increasing acidity (lower pH) increases corrosion; this is accelerated by increased temperatures, low discharge frequency and high chloride ion content.

8.5 Lubricants

Alfa Laval ref. 553216-01

8.5.1 Lubrication chart, general

Lubricating points	Lubricants
Bowl spindle ball bearings and buffers are lubricated by oil mist.	Lubricating oil as specified in "8.5.2 Recommended lubricating oils" on page 190**.**
Bowl spindle taper.	Lubricating oil (only a few drops for rust protection).
Buffers of bowl spindle.	Lubricating oil.
Bowl: Sliding contact surfaces and pressure loaded surfaces such as lock rings, threads of lock rings, bowl hood, and cap nut.	Pastes as specified in "8.5.4 Recommended lubricants" on page 193. If not specified otherwise, follow the supplier's recommendation about method of application.
Rubber seal rings.	Grease as specified in "8.5.4 Recommended lubricants" on page 193.
Friction coupling ball bearings.	The bearings are packed with grease and sealed and need no extra lubrication.
Electric motor.	Follow manufacturer's instructions.

Alfa Laval Lubricating Oil Groups:

- **Group A oil:** a high quality gear oil on paraffin base with stable AW (anti wear) additives.
- **Group B oil:** a high quality gear oil on paraffin base with stable EP (extreme pressure) additives.
- **Group D oil:** a synthetic base oil with additives stable at high operating temperatures.

Do not mix different oil brands or oils from different oil groups.

Always use clean vessels when handling lubricating oil.

Great attention must be paid not to contaminate the lubricating oil. Of particular importance is to avoid mixing of different types of oil. Even a few drops of motor oil mixed into a synthetic oil may result in severe foaming.

Any presence of black deposits in a mineral type oil is an indication that the oil base has deteriorated seriously or that some of the oil additives have precipitated. Always investigate why black deposits occurs.

If it is necessary to change from one group of oil brand to another it is recommended to do this in connection with an overhaul of the separator. Clean the gear housing and the spindle parts thoroughly and remove all deposits before filling the new oil.

NOTE

Always clean and dry parts (also tools) before lubricants are applied.

CAUTION

Check the oil level before start. Top up when necessary. Oil volume see ‘‘8.1 Technical data” on page 178.

It is of utmost importance to use the lubricants recommended in our documentation. This does not exclude, however, the use of other brands, provided they have equivalently high quality properties as the brands recommended. The use of oil brands and other lubricants than recommended, is done on the exclusive responsibility of the user or oil supplier.

Applying, handling and storing of lubricants

Always be sure to follow lubricants manufacturer’s instructions.

8.5.2 Recommended lubricating oils

Alfa Laval ref. 553218-04

Two different groups of lubricating oils are approved.

They are designated as Alfa Laval lubricating oil groups A and D.

The numerical value after the letter states the viscosity grade.

The corresponding commercial oil brands according to Recommended oil brands.

Ambient temperature °C	**Alfa Laval lubricating oil group**	**Time in operation Oil change interval**
between +15 and +45	A/150	1500 h
between ±2 and +65	D/220	2000 h

Note:

- When the separator is operated for short periods, lubricating oil must be changed every 12 months even if the total number of operating hours is less than stated in the recommendations above.
- Check and prelubricate spindle bearings on separators which have been out of service for 6 months or longer.
- In seasonal operation: change oil before every operating period.

8.5.3 Recommended oil brands

Alfa Laval ref. 553218-08

Alfa Laval lubricating oil group A/150	
Viscosity grade VG[1)] Viscosity index VI[2)]	150 > 95
Manufacturer	**Designation**
Alfa Laval	546098-80 20 litres 546098-81 4 litres 546098-82 208 litres 546098-83 1 litres
BP	Bartran 150
Castrol	Alpha ZN 150
Esso/Exxon/Statoil	Teresso 150 Terrestic 150
Mobil	DTE oil Extra Heavy
Shell	Tellus C 150 Tellus 150
Q8/Kuwait/Gulf	Gulf Harmony AW 150
Texaco/Nippon	Regal R&O 150 or Paper Machine Oil HD 150
Nearest Standard	K12-VG 150 GOST 1861-90 ISO/DIS 6743/3A VB 150-DIN 51506

1) According to ISO 3448/3104
2) According to ISO 2909

Alfa Laval lubricating oil group D/220	
Viscosity grade VG[1)] Viscosity index VI[2)]	220 > 130
Manufacturer	**Designation**
Alfa Laval	542690-80 20 litres 542690-81 4 litres 542690-82 208 litres 542690-83 1 litres
BP	Enersyn HTX 220
Castrol	Alpha Syn T 220
Chevron	Ultragear 220
Esso/Exxon/Statoil	Terrestic SHP 220, Teresso SHP 220
Lubmarine/ELF	Epona SA 220
Mobile (Engen)	SHC 630
Q8/Kuwait /Gulf	Schumann 220
Shell	Paolina 220

1) According to ISO 3448/3104
2) According to ISO 2909

8.5.4 Recommended lubricants

Alfa Laval ref. 553217-01

Pastes and bonded coatings for non-food applications:

Manufacturer	Designation	Alfa Laval No.	Application
Gleitmolybdän	Gleitmo 805 K or 805 K varnish 901 Gleitmo Paste G rapid	537086-04	All pressure loaded surfaces
Dow Corning	Molykote paste 1000 spray D321 R varnish D321 R	537086-02 535586-01 535586-02	
Rocol	Antiscuffing paste (ASP)		
Klueber	Wolfracoat C paste		
Russian Standard	VNII NP 232 Gost 14068-90		

Silicone grease:

Manufacturer	Designation	Alfa Laval No.
Dow Corning	Molykote 111 compound 100 gr 25 gr	 539474-02 539474-03
Gleitmolybdän	Silicone paste 750	
Wacker	Silicone Paste P (vacuum paste)	

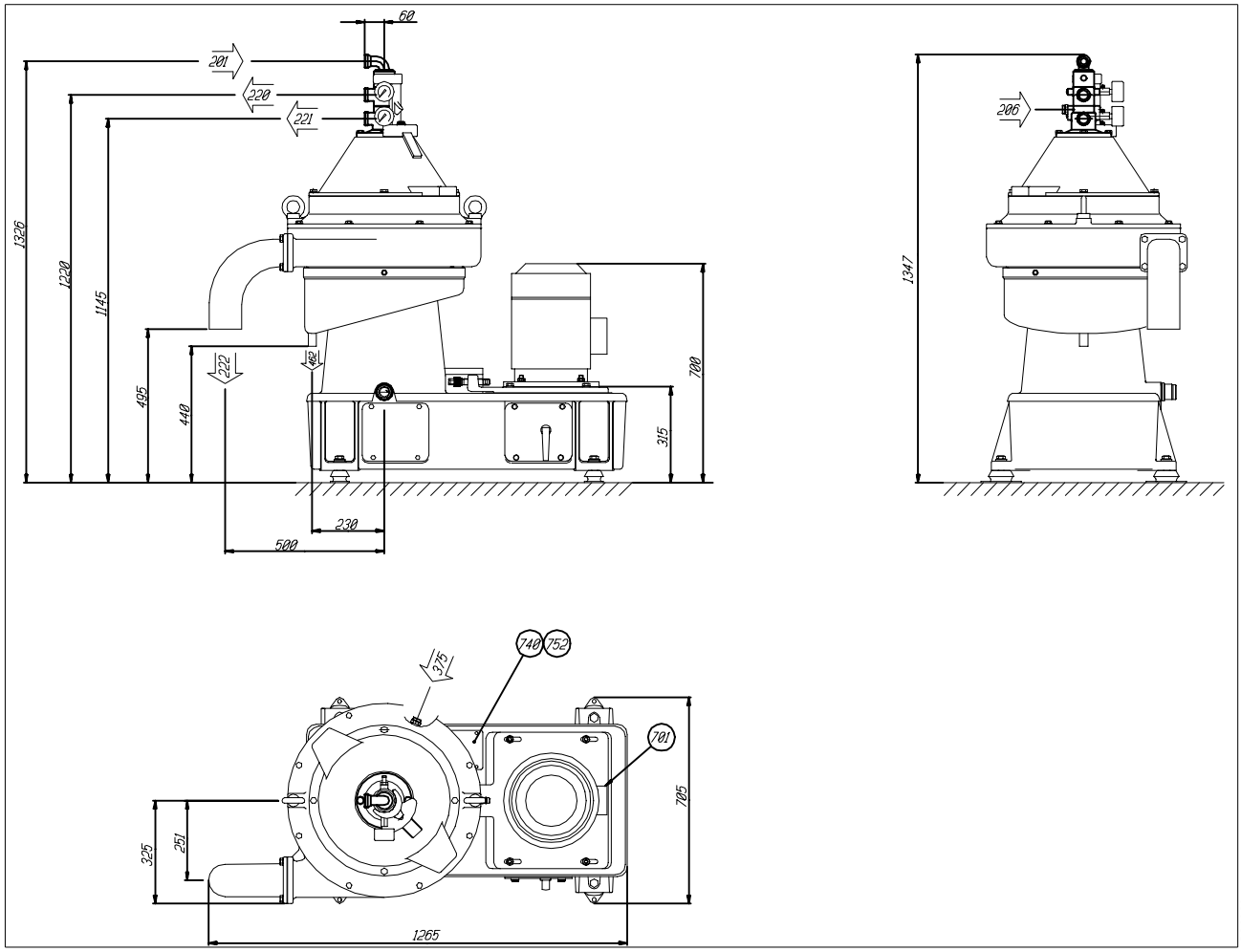
Greases for ball and roller bearings:

Manufacturer	Designation	Alfa Laval No.
BP	Energrease MMEP2 Energrease LS2	
Castrol	Spheerol SW2 EP Spheerol EPL2	
Chevron	Duralith grease EP2	
Exxon	Beacon EP2	
Mobil	Mobilith SHC 460 Mobilux EP2	
Gulf	Gulflex MP2	
Q8	Rembrandt EP2	
Shell	Cailithia EP Grease T2 Alvania EP Grease 2 or R.A	
SKF	LGEP2 or LGMT2	
Texaco	Multifak AF B2 Multifak premium 2,3	
Russian Standard	Fiol 2M, Litol 24 TU 38.201.188 - latest edition	

8.6 Drawings

8.6.1 Basic size drawing

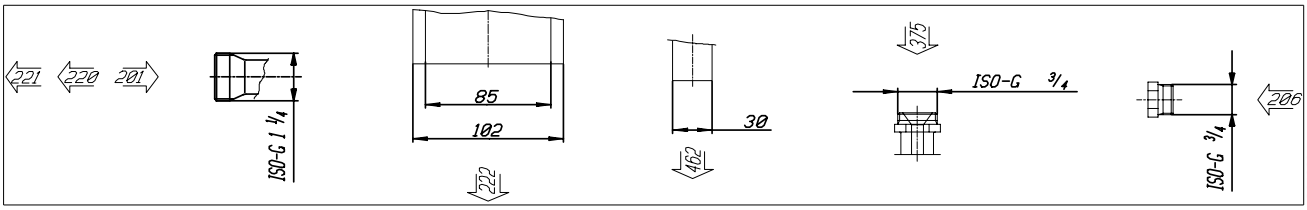
Alfa Laval ref. 548486



Connections 201, 220 and 221 turnable

8.6.2 Dimensions of connections

Alfa Laval ref. 548486

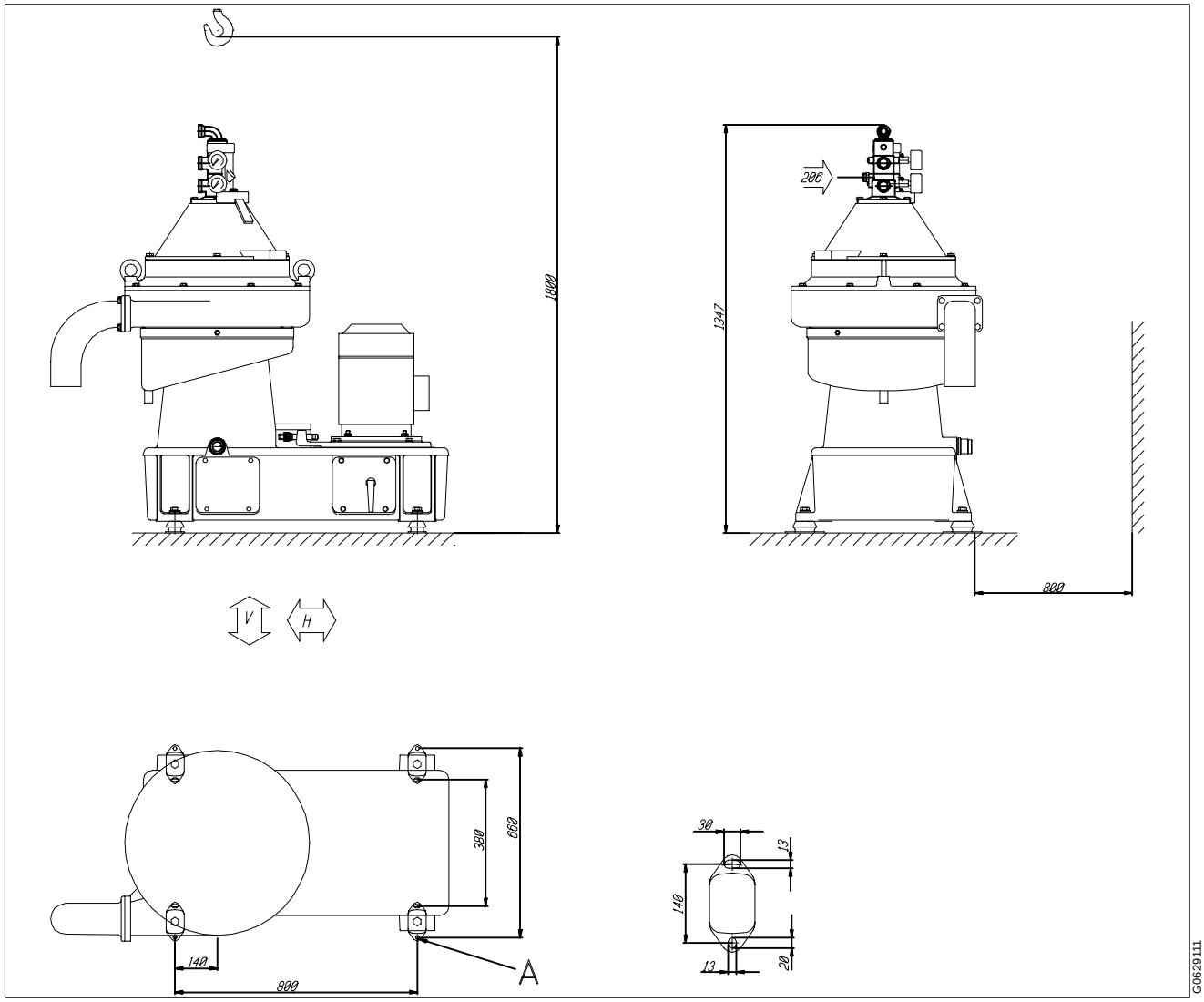


Data for connections see chapter “8.2 Connection list” on page 180.

All connections to be installed non-loaded and flexible.

8.6.3 Foundations

Alfa Laval ref. 552537



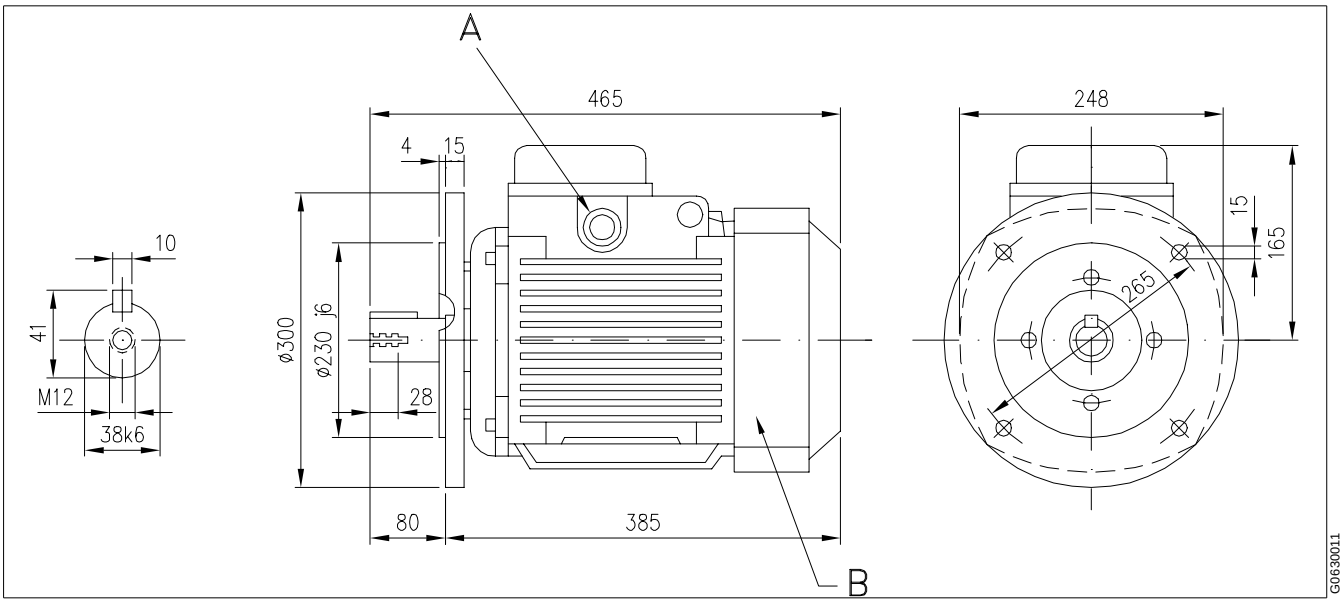
A = M12 minimum property class 8.8

Vertical force not exceeding 14 kN/foot

Horizontal force not exceeding 14kN/foot

8.6.4 Electric motor

Alfa Laval ref. 552537



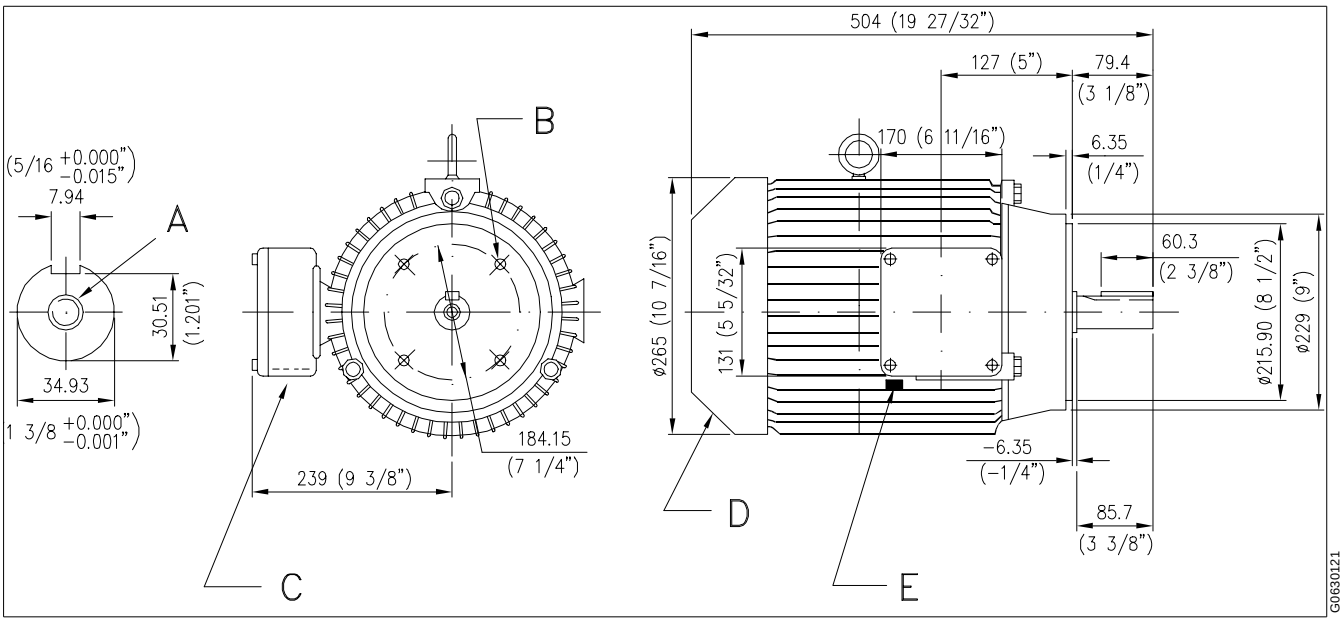
A = 2 x Pg 21, Max. cable diameter 21 mm
B = Note! The motor equipped with metal fan cover

Manufacturer	ABB Motors - CES S.A. (Spain)
Manuf. drawing	AC60-01 Parte B2
Standards	IEC 34-1, IEC 72
Size	132S
Type	MBT 132SC
Weight	54 kg
Poles	2
Insulation class	F
Bearings[4)]	DE 6208-2Z/C3 NDE 6208-2Z/C3
Method of cooling	IC 0141 (IEC 34-6)
Spec.	Totally enclosed three-phase motor for marine service [3)]

Article No.	Output kW	Speed RPM	Freq Hz	Voltage V	Current A	Pow.fac cos j	| st / | 1)	Note
552537-01	7,5	2920	50	220 D 380 Y	26 15	0,90	7,7	delta star
552537-02	7,5	2920	50	380 D	15	0,90	7,7	
552537-03	7,5	2920	50	415 D	14	0,90	7,7	
552537-04	7,5	2920	50	440 D	13	0,90	7,7	
552537-05	7,5	2920	50	500 D	11	0,90	7,7	
552537-06	7,5	2920	50	200 D	29	0,90	7,7	
552537-07	8,5	3520	60	440 D	15	0,90	7,7	
552537-08	8,5	3525	60	460 D	14,5	0,89	8,3	
552537-09	8,5	3520	60	575 D	11,5	0,90	7,7	CSA-plated
552537-10	8,5	3520	60	220 D	30	0,90	7,7	
552537-11	8,5	3525	60	230 D	29	0,89	8,3	

Type of mounting		Degree of protection
	M 1001	
	IM 3001	IP 55
	IM 3011	IP 55
	IM 3031	IP 55

Notes	
1)	lst /l=starting current /rated current at direction line starting.
2)	Thermistors tripping temp. (not applicable)
3)	The motors can be designed to fulfill requirements of following Classification Societies: – Lloyds Register of shipping (LRS) (Essential Service) – Det Norske Veritas (DnV) (Essential Service) – Germanischer Lloyd (GL) (Essential Service) – Bureau Veritas (BV) (Essential Service) – American Bureau of shipping (ABS) (Essential Service) – Registro Italiano Navala (RINA) (Essential Service) – USSR Register of Shipping (RSU) (Essential Service) – Japanese Classific. Society (NKK) (Essential Service) Required classification society must always be specified when ordering. Factory test certificate to be enclosed at the delivery. Rated output (kW) valid for temp-rise max. 90 °C.
4)	Note! Specially bearings differing from standard.



A = Hole tapped 3/8 "-16 UNC equally spaced
B = 4 holes 1/2 UNC equally spaced
C = 1 conduit entry tapped NPT 1,0"
D = Metal fan cover
E = External ground terminals

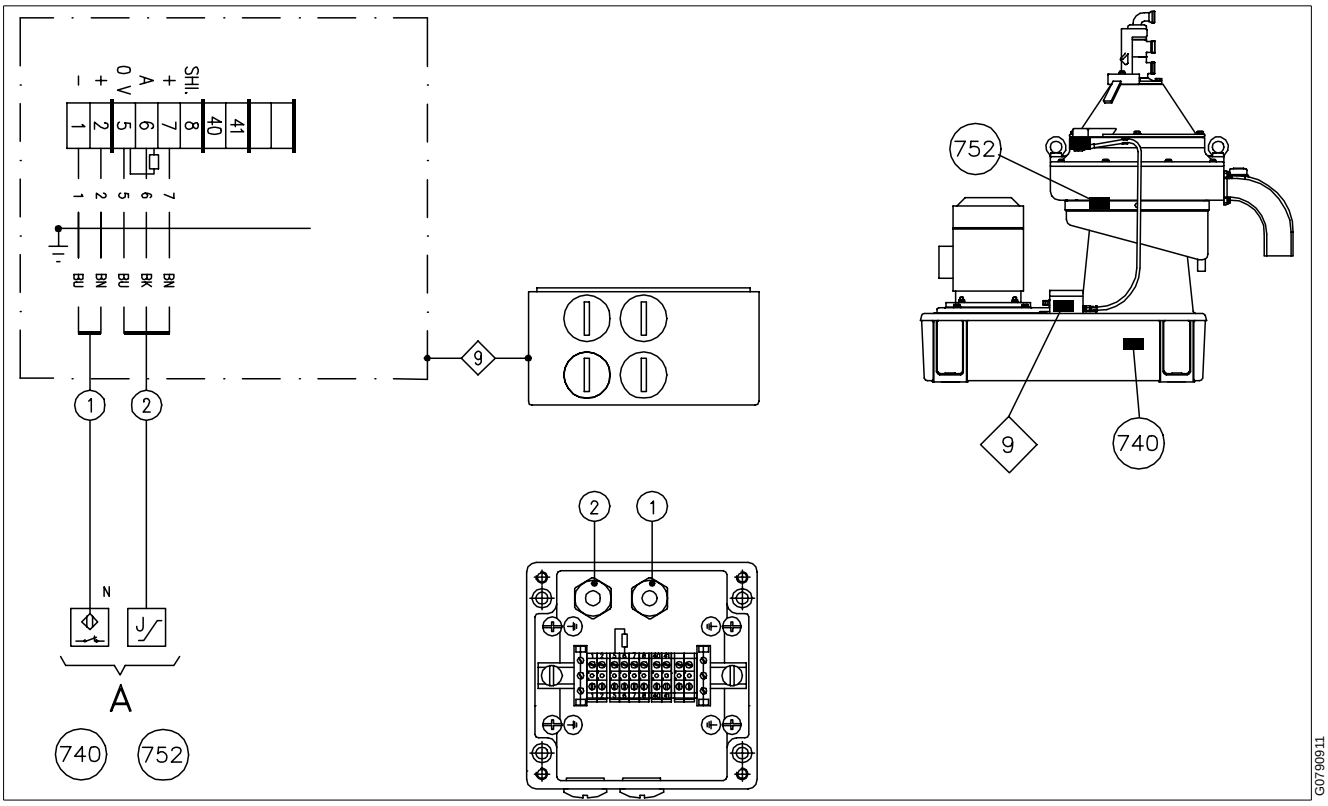
		Article No.	Output kW	Speed RPM	Freq Hz	Voltage V	Current A	Pow.fac cos j	I st / I 1)	Note
Manufacturer	Brook Crompton	554046-01	7,4	3450	60	230 Y 460 Y	25,8 12,9	0,87	6,0	Y-par Y-ser
Manuf. drawing	Brook crompton 200-B	554046-02	7,4	3450	60	220 Y 440 Y	27,0 13,5	0,87	6,0	Y-par Y-ser
Standards	NEMA/EEMAC	554046-03	7,4	3450	60	208 Y 416 Y	28,4 14,2	0,87	6,0	Y-par Y-ser
Size	NEMA 215 T	554046-04	7,4	3450	60	575 Y	10,3	0,87	6,0	CSA-appr.
Type	LF 215 TC									
Weight	76 kg									
Poles **Insulation class**	2 F									
Bearings	DE 6308-2Z/C3 NDE 6305-2Z/C3									
Method of cooling	Totally enclosed fan-cooled									
Spec.	Totally enclosed three-phase motor for marine service 3)									

Type of mounting	Degree of protection
	IP 55

Note	
1)	lst /l=starting current /rated current at direction line starting.
2)	Thermistors tripping temp. (not applicable)
3)	The motor is designed to fulfil requirements according to ABS and USCG-259 (IEEE-45). Service factor 1.15. Temp rise 80°C at rated output.
4)	Output 10 HP. Var. -01, -02, and -0,3 with 12-pin terminal board. Var. -04 with 6-pin terminal board.

8.6.5 Interconnection diagram

Alfa Laval ref. 558447 rev. 1



A = Optional eqipment

9 *Junction box*

740 *Speed sensor*

752 *Unbalance sensor*

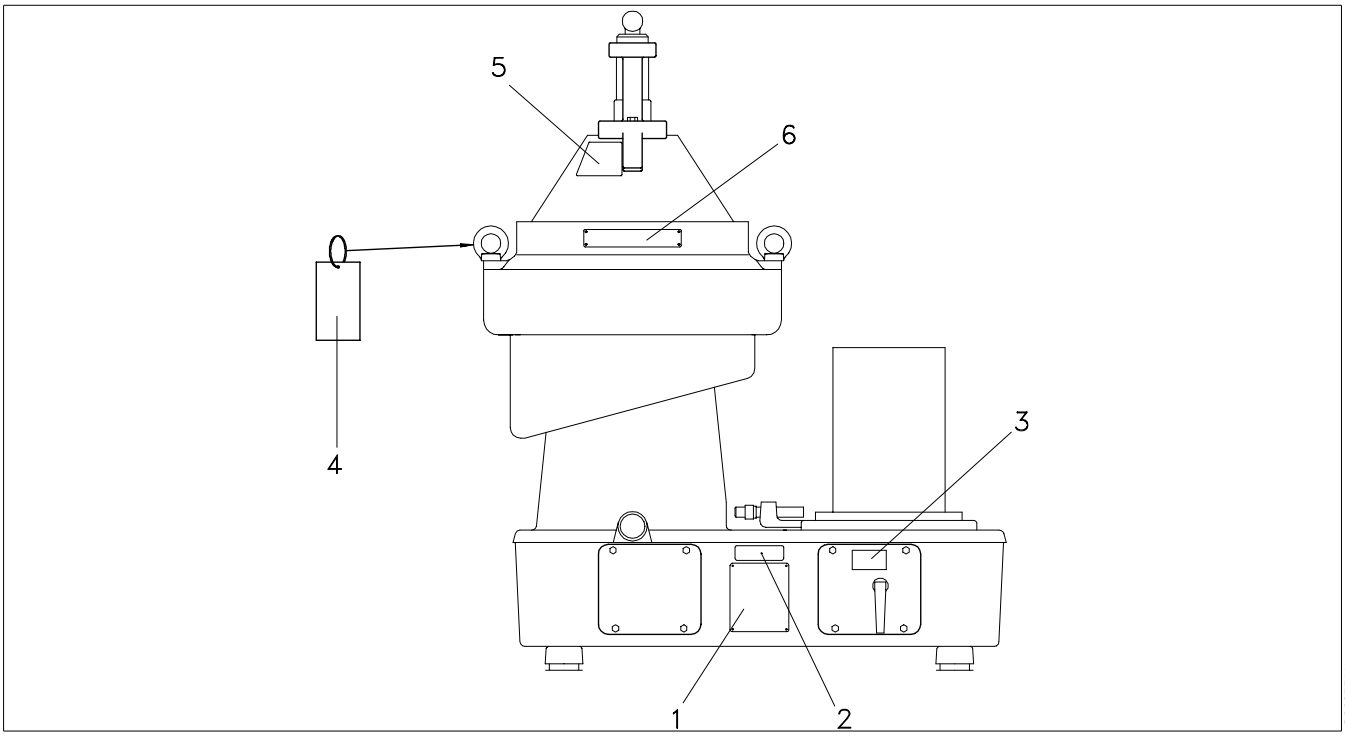
Wire colour codes
BK = Black
BN = Brown
BU = Blue
WT = White
RD = Red
GN-YW = Green-yellow
BK-YW = Black-yellow
YW = Yellow
SHI. = Shield
SIG: = Signal
TRANS = Transparent

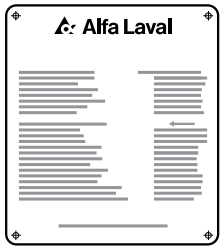
Attention:

All wires to be cut to appropriate length to match respective earth connection terminal. Wire ends to be marked with “PARTEX” PA01 (1,2,5,6,7) and fitted with ferrules with insulated collar.

8.6.6 Machine plates and safety labels

Alfa Laval ref. 548440 rev. 4





S0061411

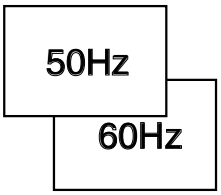
1. Machine plate

Separator	MFPX 307TFD-21
Manufacturing serial No. / Year	XXXX
Product No.	881139-01-06
Machine top part	553209-01
Bowl	548976-01
Machine bottom part	548071-03/01/05 (50 Hz/60 Hz/60 Hz NEMA)
Max. speed (bowl)	8375 r/min (50 Hz), 8400 r/min (60 Hz)
Direction of rotation (bowl)	←
Speed motor shaft	3000 r/min (50 Hz), 3600 r/min (60 Hz)
El. current frequency	50/60 Hz
Recommended motor power	7,5 kW (50 Hz), 8,5kW (60 Hz)
Max. density of feed	1100 kg/m^3
Max. density of sediment	1984 kg/m^3
Max. density of operating liquid	1000 kg/m3
Process temperature min./max.	0/100 °C

2. Representative label

Space for label indicating representative.

3. Power supply frequency



S0063111

4. Lifting instruction

Text on label:

Read instruction manual before lifting.

5. Safety label

Text on label:

DANGER

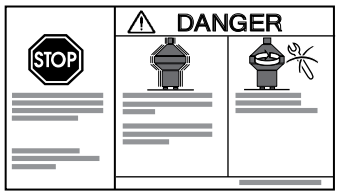
Read the instruction manuals **before** installation, operation and maintenance. Consider inspection intervals.

Failure to strictly follow instructions can lead to fatal injury.

If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.

Out of balance vibration will become worse if bowl is not full.

Separator must **stop rotating** before **any** dismantling work is started



S0061511

6. Name plate

Alfa Laval

S0063211

8.6.7 Unbalance sensor (option)

Type: Inductive analogue sensor

Supply voltage: 15-30 V DC

Output voltage: 1 - 9 V DC

For other technical information see chapter
“8.2 Connection list” on page 180,
“8.3 Interface description” on page 182 and
“8.6.5 Interconnection diagram” on page 202.

8.6.8 Speed sensor (option)

Type: Inductive proximity switch

Supply voltage: 8 V

Output current: less than 1 mA (activated)
greater than 3 mA (not act.)

For other technical information see chapter
“8.2 Connection list” on page 180 ,
“8.3 Interface description” on page 182 and
“8.6.5 Interconnection diagram” on page 202.

8.7 Storage and installation

8.7.1 Storage and transport of goods

Storage upon arrival

Specification

Upon arrival to the store, **check all components and keep them:**

1. Well stored and protected from mechanical damage and theft,
2. Dry an protected from rain and humidity
3. Organized in the store in such a way that the goods will be easily accessible when installation is about to take place.

Storage at standstill

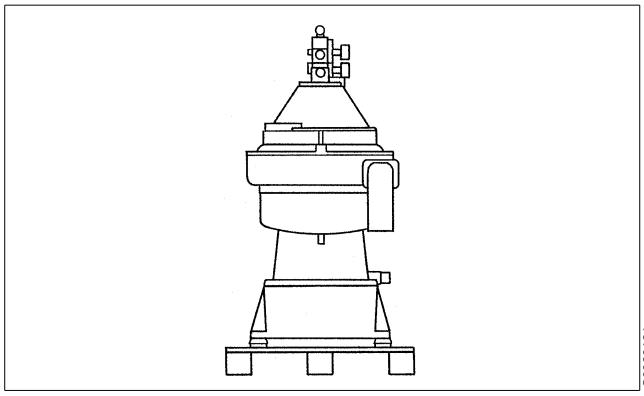
If the separator is not used for a longer period:

1. Lift out the bowl.
2. Keep the separator and bowl well stored and protected from mechanical damage and theft.
3. Keep the separator and bowl dry an protected from rain and humidity
4. Perform a Major Service.
5. Change the oil before starting.

A separator can be delivered with different types of protection:

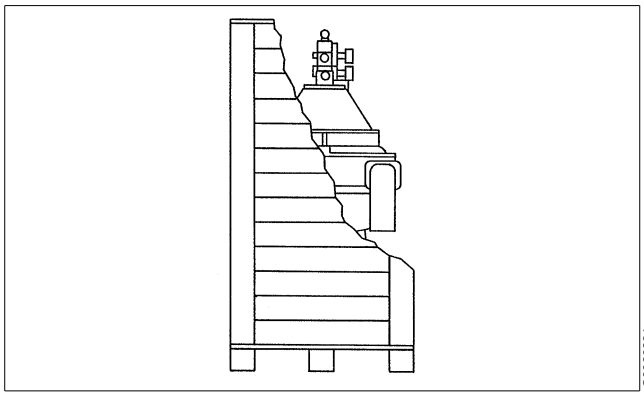
- Fixed on a pallet.

  The separator must be stored in a storage room and protected as per paragraphs 1 and 2 above.



- In a wooden box which is not water tight.

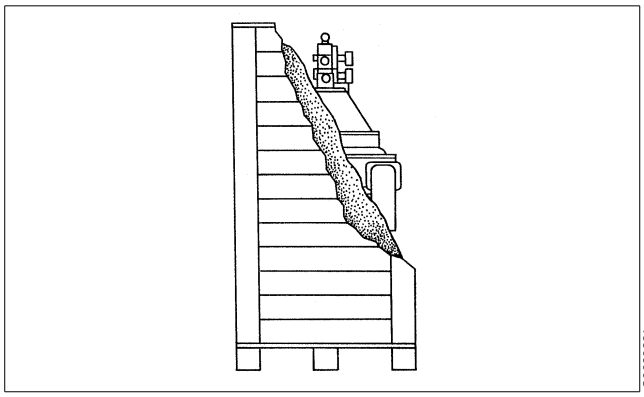
  The separator must be stored as per paragraph 2 above.



- In a special water-resistant box for outdoor storage.

  The separator and its parts have been treated with an anti-corrosion agent. Once the box has been opened, store as per paragraph 2 above.

  The packaging for outdoor storage is only to special order.



Transport

Specification

- During transport of the separator, the frame hood and bowl **must always be removed from the machine.**
- When lifting a separator it must always be **hung securely**. See chapter “5.5 Lifting” on page 77.

WARNING

Crush hazards

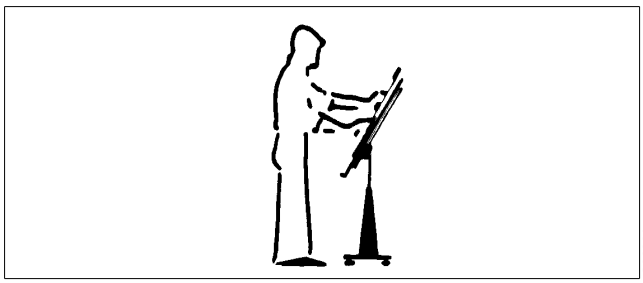
Use correct lifting tools and follow lifting instructions.

- During erection, all inlets and outlets to separators and accessories must be covered to be protected from dirt and dust.

8.7.2 Planning and installation

Introduction

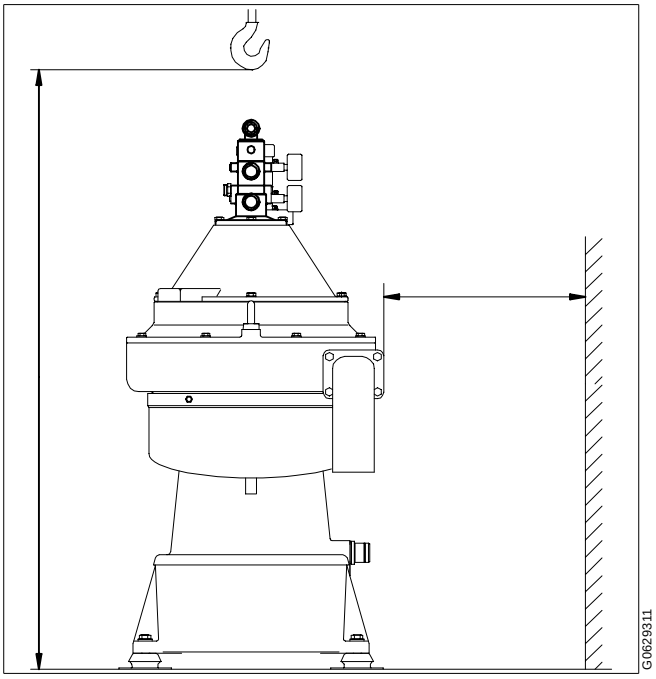
The space required for one or more separators can be calculated by consulting the dimension drawing in this chapter and instructions for ancillary equipment, electrical and electronic equipment and cables.



Important measurements

Important measurements are the minimum lifting height for lifting tackle, shortest distance between driving motor and wall, free passage for dismantling and assembly, maintenance and operation.

Plan your installation with sufficient room for the controls and operation so that instruments are easily visible. Valves and controls must be within convenient reach. Pay attention to space requirements for maintenance work, work benches, dismantled machine parts or for a service trolley.



Space for separator

The separator shall be placed in such a way that suitable space for maintenance and repair is obtained.

Specification

- See the dimensioned drawing in chapter ‘‘8.6 Drawings” on page 195 for the service space required with the separator installed.

Recommendation

- The spanner for the large lock ring should have sufficient space to make a complete turn without touching any of the ancillary equipment surrounding the separator.

Lifting height for transport of bowl

Specification

- A minimum height is required to lift the bowl, bowl parts and the bowl spindle, see the dimensioned drawing in chapter ‘‘8.6 Drawings” on page 195**.**

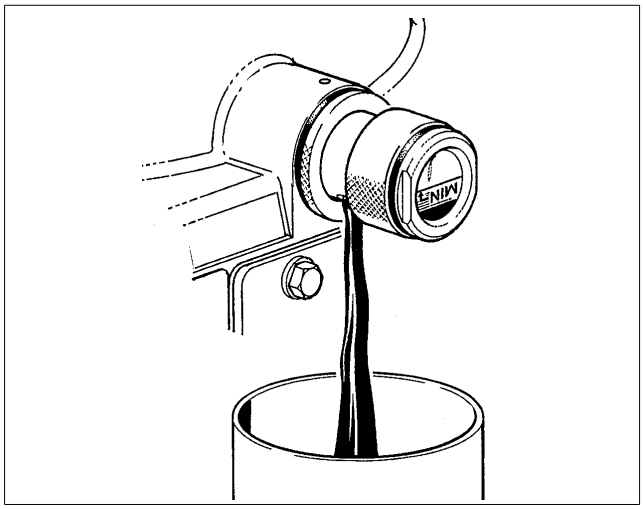
Recommendation

- When two or more separators are installed, the lifting height may have to be increased to enable parts from one separator to be lifted and moved over an adjoining assembled separator.

Space for oil changing

Specification

The oil filling device must not be blocked by floor plate arrangement, etc.



Recommendation

- It should be possible to place a portable collecting tray under the oil filling device for changing oil.

8.7.3 Foundations

NOTE

When lifting a separator it must always be **hung securely**. See the separate instruction in chapter “5.5 Lifting” on page 77.

Specification

- The separator should be installed at floor level, see the dimensioned drawing on “8.6.1 Basic size drawing” on page 195.
- The separator must be installed on a strong and rigid foundation to reduce the influence of vibrations from adjacent machinery.
- The foundation should be provided with a cofferdam.
- Fit the separator frame on the foundation as follows:
  - Check that the bolts do not press against the edges of the holes, otherwise the elasticity of the mounting of the separator frame will be impeded.
  - Fit height adjusting washers required.
  - Check that the separator frame is horizontal and that all feet rest on the foundation.
  - Tighten the screws.

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